ELECTRICAL WEST

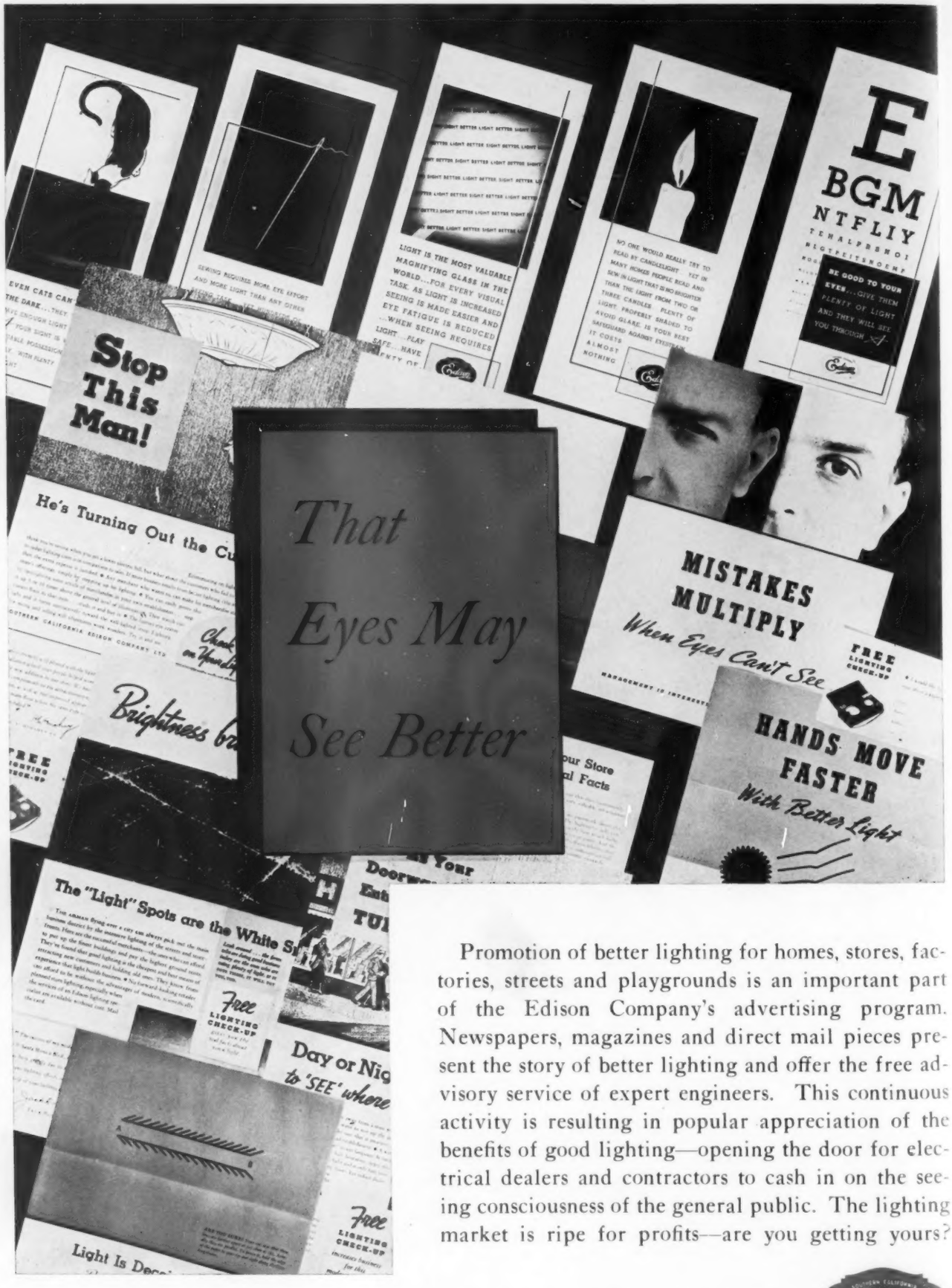
THE ALL-INDUSTRY MAGAZINE OF PROGRESS

Fifth Annual Convention-in-Print

JUNE 1937

Price 50c Per Copy

McGraw-Hill Co. of Calif.


Stop This Man!
That Eyes May See Better
MISTAKES MULTIPLY
When Eyes Can't See
HANDS MOVE FASTER
With Better Light
BE GOOD TO YOUR EYES...GIVE THEM PLENTY OF LIGHT AND THEY WILL SEE YOU THROUGH
LIGHT IS THE MOST VALUABLE MAGNIFYING GLASS IN THE WORLD...FOR EVERY VISUAL TASK AS LIGHT IS INCREASED SEEING IS MADE EASIER AND EYE FATIGUE IS REDUCED
He's Turning Out the Cu
The "Light" Spots are the White Sp
Free LIGHTING CHECK-UP
Day or Nig
to 'SEE' where
Light Is Dec

Promotion of better lighting for homes, stores, factories, streets and playgrounds is an important part of the Edison Company's advertising program. Newspapers, magazines and direct mail pieces present the story of better lighting and offer the free advisory service of expert engineers. This continuous activity is resulting in popular appreciation of the benefits of good lighting—opening the door for electrical dealers and contractors to cash in on the seeing consciousness of the general public. The lighting market is ripe for profits—are you getting yours?

SOUTHERN CALIFORNIA EDISON COMPANY LTD.

6-37

ELECTRICAL WEST (with which is consolidated The Journal of Electricity), June, 1937, Vol. 78, No. 6. Published monthly by the McGraw-Hill Company of California, 883 Mission St., San Francisco, Calif. Entered as second class matter at the post office at San Francisco under the Act of March 3, 1879. Additional entry as second class matter at the post office at Los Angeles. Printed in U. S. A. Subscription rate in U. S. and U. S. possessions, and Canada, $2 per year; all other countries $3 gold (thirteen shilling). Single copy, 25c.
Copyright, 1937. McGraw-Hill Company of California.

ELECTRICAL WEST

WITH WHICH ARE CONSOLIDATED THE "ELECTRICAL JOURNAL," THE "JOURNAL OF ELECTRICITY, POWER & GAS," AND THE "JOURNAL OF ELECTRICITY"

ESTABLISHED 1887

Vol. 78 No. 6

Staff

George C. Tenney, Editor
W. A. Cyr, Associate Editor
C. W. Leihy, Engineering Editor
Wayne Snowden, Assistant Editor
Roy N. Phelan, Manager
Hans Hjorth, Typography

Editorial Advisory Board

Utilities:

R. E. Fisher, Vice-President in Charge of Public Relations and Sales, Pacific Gas and Electric Company, San Francisco.

J. A. Hale, Chief Engineer, Utah Power & Light Company, Salt Lake City

Glenn L. Jackson, Vice-President and Commercial Manager, The California Oregon Power Company, and Mountain States Power Company, Medford

Frank McLaughlin, President, Puget Sound Power & Light Co., Seattle

L. T. Merwin, President, Northwestern Electric Company, Portland

W. C. Mullendore, Executive Vice-President, Southern California Edison Company Ltd., Los Angeles

Manufacturers:

Vernon Brown, President, Square D Company, Inc., Los Angeles, Calif.

W. R. Marshall, Vice-President, Westinghouse Electric & Mfg. Co., San Francisco

A. S. Moody, Northwest Manager, General Electric Company, Portland

Wholesalers:

J. I. Colwell, Northwest Manager, Graybar Electric Co., Inc., Seattle

N. W. Graham, Graham-Reynolds Electric Co., Los Angeles

Contractors:

Lloyd Flatland, Globe Electric Works, San Francisco

S. G. Hepler, Arrow Electric Co., Seattle

Dealers:

H. H. Courtright, President, Valley Electrical Supply Company, Fresno

J. C. Chamberlain, Secretary-Manager, Bureau of Radio and Electrical Appliances, San Diego

McGraw-Hill Company of California
883 Mission Street
San Francisco, California

Publishers of
ELECTRICAL WEST

James H. McGraw, Chairman of the Board
R. A. Balzari, President
George C. Tenney, Vice-President
Roy N. Phelan, Secretary and Treasurer

Member, Audit Bureau of Circulation
Member, Associated Business Papers, Inc.

Copyright 1937 by McGraw-Hill Co. of California

The Convention Program

Welcome from the Editors 45

Presidential Addresses

"This Is 1937—So Let's Be that Way," by George M. Gadsby, President, Northwestern Electric Light & Power Assn. 46
"Our Is a Twofold Responsibility," by Guy W. Faller, President, Rocky Mountain Electrical League 47
"Fulfilling Our Obligation," by F. B. Lewis, President, Pacific Coast Electrical Assn. 49

Electra's Husband 50
Bill Jones Speaks to the Convention 51
"Embarrassing Questions that We Want the Public to Ask"—Wiring 52
"Informal Investigation—A New Approach to Regulation," by E. F. McNaughton, Director, Public Utilities Department, California Railroad Commission 54
"Westward the Course of Empire"—World Fair 56

Engineering Symposium

"Field Experience with Low Cost Residential Underground" 58
"The Operators' Viewpoints on Demand Meter Practice" 65
"Hydraulic Repair Practice" 67

"Rural Electrification—Can We Make It Pay?" 69
"In Quest of Light and Intelligence"—School Lighting 71

Symposium

"Selling the Minimum Customer," by Western Commercial Men and Women 75

Appliance Sales Guide—Roasters 81

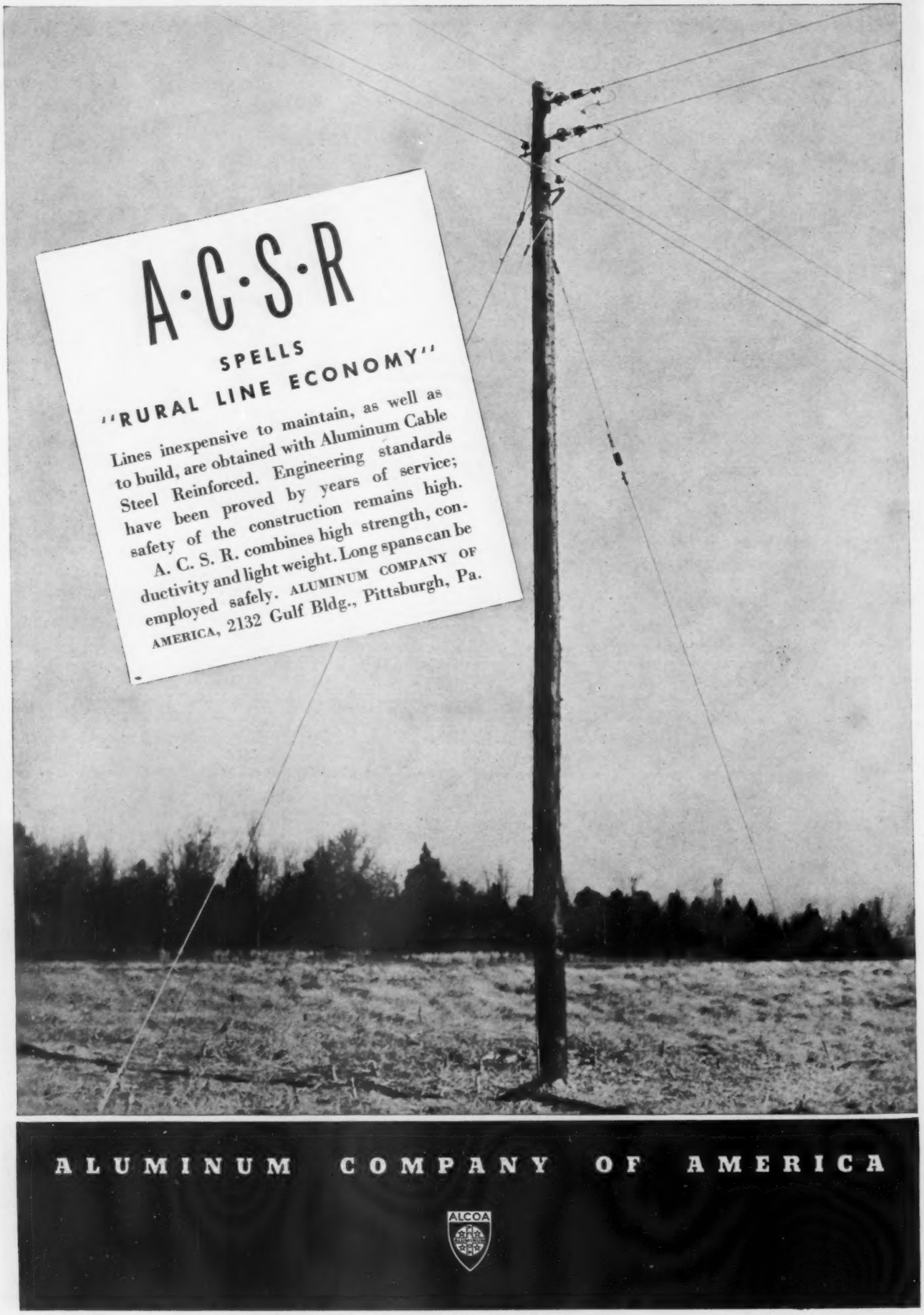
Northwest Association Papers

See Separate Contents Page 85

P.C.E.A. Convention Report

"Progress and Public Service" 149
"Ramblings in Research" 150
"Light Marches On" 151
"New Load from New Lights" 152
"Local Wiring Program Suggested in Skits" 153
"Electrical Magic in Agriculture" 154
"When Disaster Strikes" 155
"The Industry Looks Ahead" 156
"Yesterday and Tomorrow" 157

Maintenance Engineering 159
News of the Industry 160
Where to Buy It in the West 187


A·C·S·R
SPELLS
"RURAL LINE ECONOMY"
Lines inexpensive to maintain, as well as to build, are obtained with Aluminum Cable Steel Reinforced. Engineering standards have been proved by years of service; safety of the construction remains high. A. C. S. R. combines high strength, conductivity and light weight. Long spans can be employed safely. ALUMINUM COMPANY OF AMERICA, 2132 Gulf Bldg., Pittsburgh, Pa.
ALUMINUM COMPANY OF AMERICA
ALCOA

This

BRASS BUSHING

MEANS GREATER STRENGTH PERFECT THREADS AND FULL PROTECTION AGAINST PIN EXPANSION . . .

If you haven't tried Hemingrays, order some today from your jobber or write for samples and prices. Ratings up to 15,000 volts. Available in clear or brown color.

OWENS-ILLINOIS GLASS COMPANY • Hemingray Division, Muncie, Ind.

FOR MODERN POWER LINE INSULATION

Order HEMINGRAY Glass INSULATORS

A Store Without Windows

The only daylight that reaches the interior of the modern building housing the great Eastern store, Huntington Park, Calif., is the little that is admitted through the glass in the front and side doors. All lighting is from recessed "Pittsburgh" Permaflectors used with flush type fixtures and from "Pittsburgh" Lustroliers.

Above—All space on the first floor as well as on the second floor is lighted from flush fixtures in the ceiling, except the well in which is installed three "Pittsburgh" No. 5100 Lustroliers with thousand watt lamps.

Below—The third floor of the building is lighted by 169 fixtures recessed in the ceiling with a special made hinged unit, equipped with 12" x 12" square Tuf-flex glass. These units are equipped with B-508 Permaflectors with 300-watt inside frosted lamps. In the extreme front of the space shown are four rooms equipped with special made fixtures using P-40 Permaflectors

Display windows are equipped with 150 Permaflectors No. 85 and 99, the latter being equipped with 300-watt lamps.

The average intensity throughout the store is 20-foot candles. The ceilings are 10′ 4″ high with built-in units spaced on approximately 10½′ x 11′ centers.

Write to our nearest representative for complete details on built-in direct and indirect lighting. He will be glad to work with you in solving any problem.

PITTSBURGH
Reflector Company Pittsburgh

FRANK E. HASTINGS
810 Transportation Building
LOS ANGELES

HAL A. GARDNER
807 Flatiron Bldg.
544 Market St.
SAN FRANCISCO

Pittsburgh Permaflector

RAYMOND ACKERMAN
318 Dooly Block
SALT LAKE CITY

LYMAN D. MORGAN
239 Securities Bldg.
SEATTLE

B.T.C. Hardware Used!

DROP FORGED

No. 5014 Strain Clamps

No. 8550 Double Strain Yoke Set

Caps and Ball Studs

Photographed in our studio in duplicate of a hook-up in actual use. Details on request.

If it's Hi-Line Hardware - it's in this Book ..... Sold through Your Insulator Mfr. Only

The Brewer-Titchener Corporation
Cortland, New York

115 VOLTS

NO DOUBT ABOUT IT!

The extra large scale opening on WESTON portable test instruments insures full illumination . . . certain reading . . . of the hand calibrated mirror scale. And the dependability behind the instrument builder's name makes each reading *doubly* certain . . . Weston Electrical Instrument Corporation, 577 Frelinghuysen Avenue, Newark, New Jersey.

The WESTON Model 430 line of portable test instruments includes DC and AC instruments and single phase wattmeters. Compact, rugged, dependable...and inexpensively priced. Illustrated literature on request.

WESTON *Instruments*

Eicher & Bratt,
263 Colman Bldg.
Seattle, Wash.

PACIFIC COAST REPRESENTATIVES
Herman E. Held
420 Market St.
San Francisco, Calif.

A. A. Barbera,
Subway Terminal Bldg.
Los Angeles, Calif.

"LOOK!

TRANSFORMERS RIGHT AT THE LOAD CENTER!"

C. SCHMIDT and SONS, brewers, in Philadelphia, Pa., made a substantial saving in total installed transformer cost, saved space, and improved voltage regulation when they engaged the Union Electric Contracting Co. to install these G-E Pyranol transformers in their plant. No expensive fireproof vault was needed, since Pyranol is noninflammable and nonexplosive; and the transformers could be installed at the load center, thus avoiding long runs of secondary copper. ● Pyranol, General Electric's remarkable cooling and insulating liquid, makes it possible to install transformers indoors in practically any location—at a considerable saving. Recognition by the National Electrical Code permits their installation with many of the restrictions applying to oil-filled transformers removed. ● It will pay you to investigate the possibility of using Pyranol transformers—particularly if you are considering a new indoor installation. More than 500 of these transformers are installed, many of them having been in use almost five years, all giving excellent service. Write the nearest General Electric sales office for complete information, or General Electric Company, Dept. 6K-201, Schenectady, New York. Ask for Bulletin GEA-2048.

300-45

GENERAL ELECTRIC

OKONITE-CALLENDER

OIL-FILLED

Paper-Insulated Cables

Okonite-Callender oil-filled cable provides an economical means of solving many problems that arise in operating high-voltage, underground systems.

Among the important advantages of oil-filled cable are:

Smaller outside diameters
Greater insulation stability
Greater allowable current carrying capacity

It is recommended that oil-filled cable be given consideration in plant problems involving high-voltage, underground cables. We offer an active, practical engineering service for assistance in such studies. Our bulletin on oil-filled, paper insulated cables will be mailed upon request.

THE OKONITE COMPANY

Founded 1878

HAZARD INSULATED WIRE WORKS DIVISION

THE OKONITE-CALLENDER CABLE COMPANY, INC.

EXECUTIVE OFFICE: PASSAIC, N. J.

New York Boston Seattle Buffalo Chicago Dallas Detroit Atlanta
Philadelphia Los Angeles Pittsburgh St. Louis Washington San Francisco

Factories: Passaic, N. J. Wilkes-Barre, Pa. Paterson, N. J.

OKONITE QUALITY CANNOT BE WRITTEN INTO A SPECIFICATION

MERCHANDISERS OF KILOWATTS

ON YOUR SALES STAFF

...but NOT on your Payroll!!

Every day of the week . . . every week of the year hundreds of Westinghouse representatives and jobbers, thousands of Westinghouse dealers are pounding pavements . . . interviewing prospects to further the sale of Westinghouse equipment. Millions of dollars worth of ranges, refrigerators, lighting, air conditioning, motors and a host of other products are sold through their efforts annually.

All of these men are an essential part of the Westinghouse organization. Although not on your Central Station payroll, they play an important part in building load on your lines and creating additional revenue for you. The revenue continues through-out the life of every current consuming device sold.

Westinghouse load building equipment now in service and continually being added accounts for millions of kilowatt-hours yearly. Large expenditures are continuously made to promote the use of electricity and improve standards of living. This Westinghouse activity to increase the use of electrical energy is supported every time you specify "Westinghouse" for your electrical equipment needs.

J 91281

W
WESTINGHOUSE ELECTRIC

Westinghouse

NOT "Just a Register"
It's GOLD-PLATED and JEWELED to minimize Friction and Corrosion

No matter where a Westinghouse Meter is installed, its register gears do not corrode . . . friction is almost absent . . . because all Westinghouse register gears and shafts are heavily gold-plated. Naturally, this increases manufacturing costs, but such refinements assure SUSTAINED ACCURACY and the LOWEST MAINTENANCE COST over long periods of years.

GOLD-PLATING is just one of those extra values which is expected from Westinghouse . . . *and furnished at no extra cost.*

IN ADDITION,

the gold-plated register has these other unequalled refinements:

1 *Sapphire Bearing*—The fastest moving gear shaft is supported by a steel pivot that rotates on a polished sapphire jewel . . . a refinement found in no other watthour meter register.

2 *Precision-Milled Gear Teeth* that are inspected under a projecting microscope with a magnification of 100 diameters, and compared with master gear outlines to assure uniformity . . . just another Westinghouse "extra" to minimize friction.

3 *No Register Adjustment*—This gold-plated register is fastened to the meter element by means of two bayonets and two set screws. When pushed into place, its first gear is automatically meshed to exactly the correct depth with the disk shaft pinion . . . no guess work and no manipulation.

4 *Protected Gears*—The rigid frame construction protects all gears from damage in handling.

• • •

Such outstanding construction simplifies every part of Westinghouse watthour meters. Designed not only for initial but also for sustained accuracy, these meters assure the most accurate low-cost registration of consumed energy.

Ask our representative for detailed information. J 40084

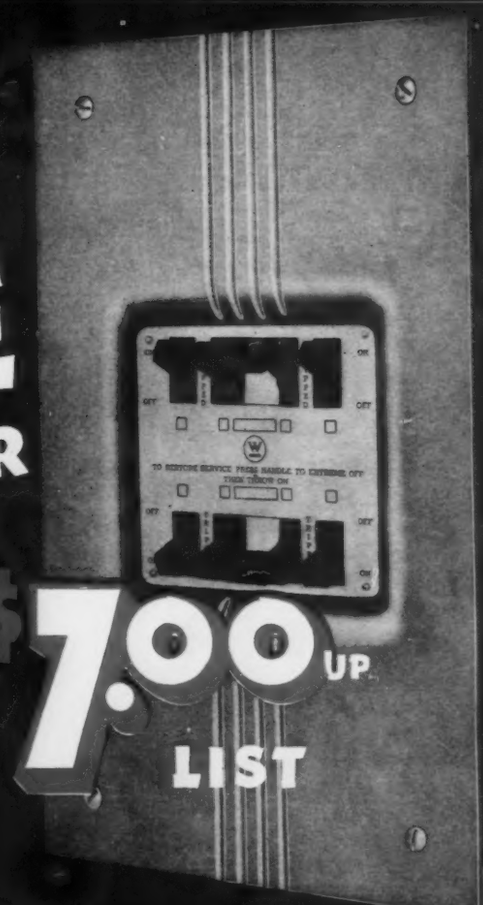
Westinghouse

METERS
INSTRUMENTS
RELAYS

all 3 AGREE

TODAY'S BEST BUY IN CIRCUIT PROTECTION IS

THE NOFUZE LOAD CENTER



At the amazing new low prices, Nofuze circuit protection can now be installed with every new or rewiring job, every range and water heater installation. Equipped with the famous "De-ion" circuit breakers, instead of switches and fuses, it brings circuit protection on a par with other electrical conveniences.

J 60060

Now ONLY $7.00 UP LIST

1 SO EASY TO OPERATE *Customers* AGREE

No hunting for fuses, no waiting for the service man. Even a child can restore service with the new Westinghouse low-cost Nofuze Load Center in all ordinary cases of circuit interruption. *Simply flip the breaker handle first to "off," then to "on" and service is instantly restored.*

Factory-sealed, Nofuze Circuit Protection offers greater safety because every live part is guarded against danger to unskilled fingers. Fool-proof, Nofuze cannot be held closed against a continued short circuit or dangerous overload—provides *positive* protection.

2 HELPS SELL MORE JOBS *Contractors* AGREE

Every prospective wiring customer to whom you show Nofuze will recognize its convenience, its safety, its attractive appearance. The contractor who recommends Nofuze offers something customers can understand is better, something they will call to the attention of friends. Use Nofuze to help sell more wiring jobs!

3 CUTS SERVICE COSTS BUILDS GOOD WILL AGREE *Utilities*

Every customer who installs a Westinghouse low-cost Nofuze Load Center is one less potential source of complaints and service expense resulting from fuse outages. Every Nofuze installation you make or recommend now will pay dividends in good-will for years to come.

Write for catalog. Westinghouse, 5-N, East Pittsburgh, Pa.

W WESTINGHOUSE ELECTRIC

Westinghouse

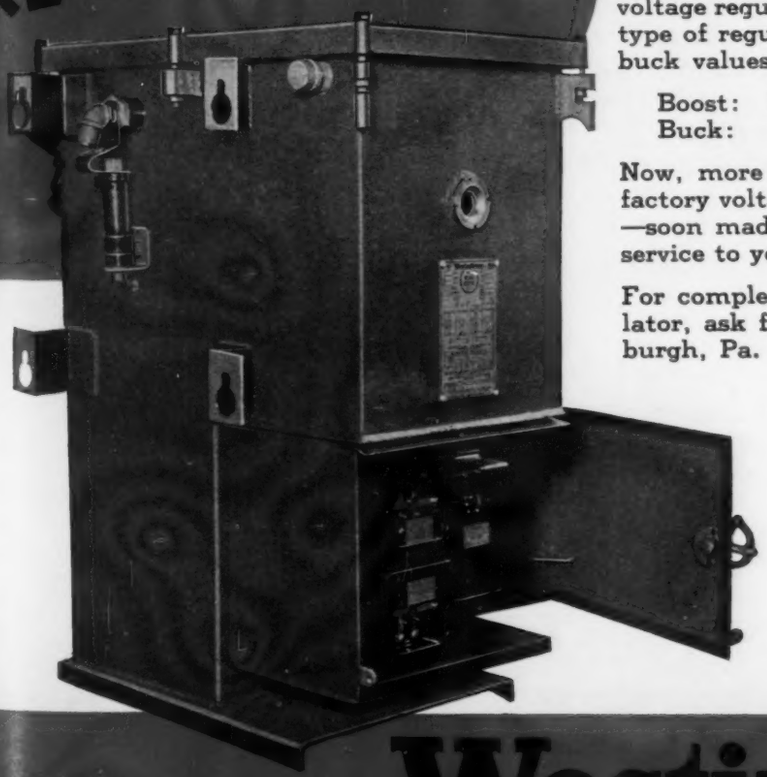
NOFUZE CIRCUIT PROTECTION

OUTSTANDING FEATURES OF THE LR BOOSTER-REGULATOR

1. Simple, quick-motion tap changer with double-moving contacts, minimizes lamp flicker.
2. Sturdy and simple control with reset timing relays—adjustable from 10 seconds to 50 minutes.
3. Control box either bolted to booster-regulator tank or mounted separately at any convenient location.
4. Tap changer and transformer in separate compartments—easily accessible by removing top cover.
5. Completely self-contained—arranged for either pole or platform mounting as desired.
6. Surge-protected by three built-in "De-ion" gaps.

VOLTAGE REGULATION
...ON RURAL LINES

A *4-step* BOOSTER REGULATOR



Rural distribution lines and feeders supplying isolated loads have presented a difficult economic problem from the standpoint of voltage regulation. In the majority of cases the conventional types of regulators have been considered too expensive and their accurate performance unnecessary. On the other hand, the voltage control obtained from a one- or a two-step booster equipment may not meet all the needs of this class of feeder.

The LR Booster-Regulator is particularly applicable to conditions where load changes over a wide range cause considerable fluctuation in voltage as well as low voltage during heavy-load periods. A boost of ten per cent corrects the low-voltage condition while the steps of 2½ per cent each give the desired degree of voltage regulation. It broadens the application of this type of regulator by providing the following boost or buck values:

Boost:	10%	7½%	5%	2½%	0%
Buck:	0%	2½%	5%	7½%	10%

Now, more than ever before, you can obtain satisfactory voltage regulation for rural lines at a low cost —soon made up by increased revenue and improved service to your customers.

For complete information on the LR Booster-Regulator, ask for Catalog 47-230, Room 7-N, East Pittsburgh, Pa.

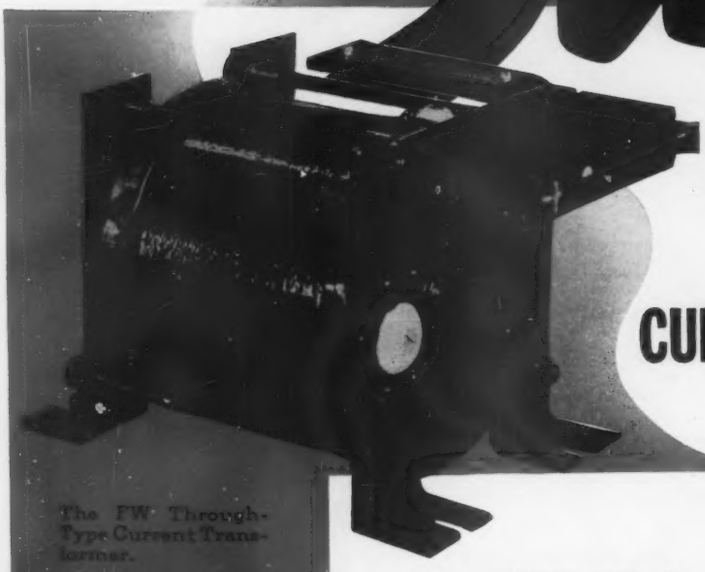
J 70041

W WESTINGHOUSE ELECTRIC

Westinghouse

Save

WITH THE *New* FW CURRENT TRANSFORMER



The FW Through-Type Current Transformer.

FW Transformers greatly simplify metering service connections.

THE FW Current Transformer is built in only two ratings; 200/5 and 600/5 amperes. Yet—so great is it's overload capacity that these two ratings alone cover a primary current range from 100 to 1200 amperes. Just this one feature means a double saving for you . . .

*Savings due to the reduced variety of transformers needed for stock.

*Saving in the cost of transformer changes due to load fluctuations.

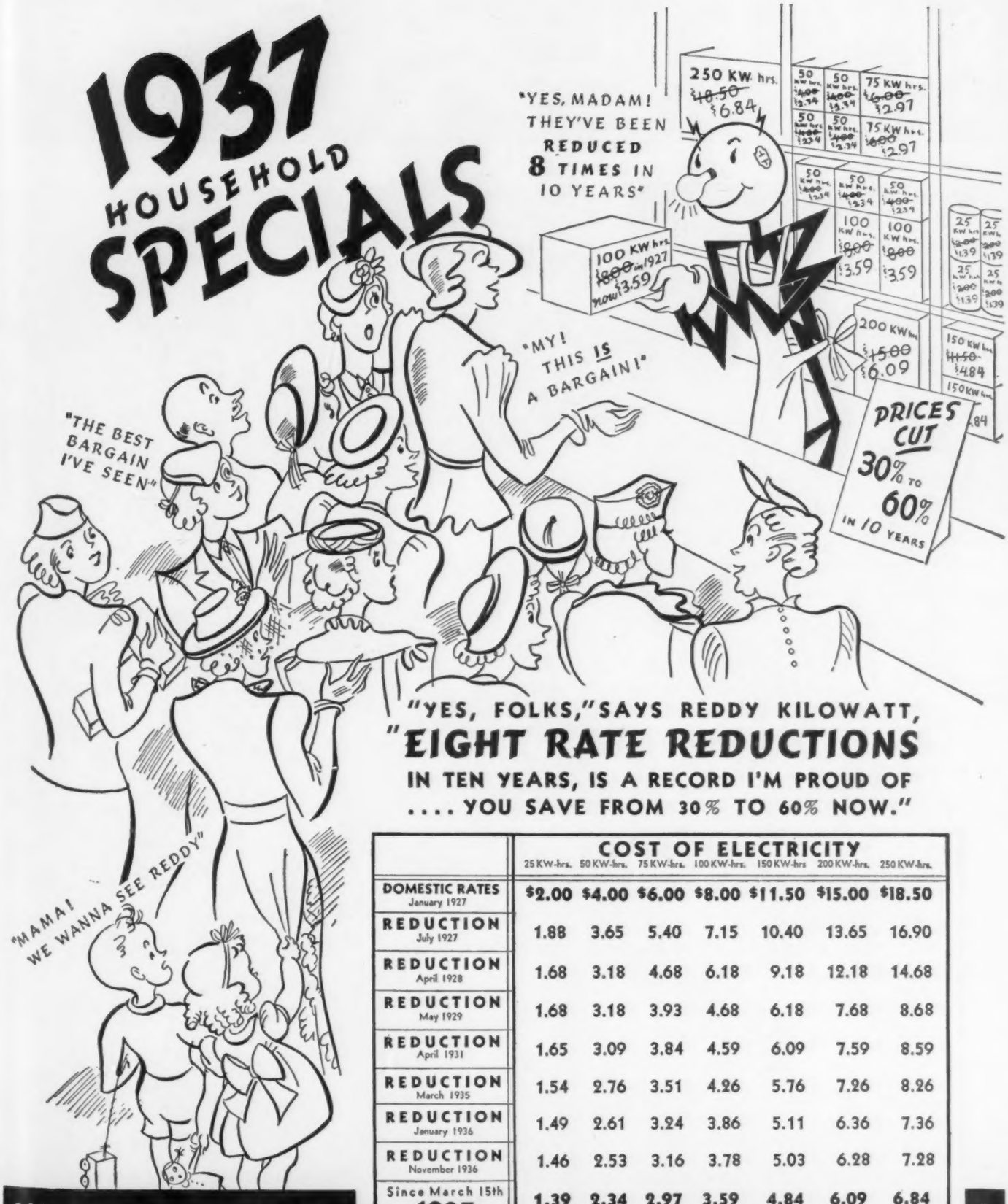
In addition, the new FW is extremely small and compact, saving valuable space in meter boxes. It employs through-type construction—1¼" opening on the 200 ampere and 2" opening on the 600 ampere size; no primary connections—yet excellent accuracy is obtained from light load to 200% load. And, due to advanced production methods and simplified design, the price is low. J 70042

For more detailed information on this new Current Transformer, call our local representative or write for Rotoprint 855. Address Westinghouse Electric & Manufacturing Co., Room 7-N, East Pittsburgh, Pa.

W WESTINGHOUSE ELECTRIC

Westinghouse

1937 HOUSEHOLD SPECIALS


"YES, MADAM! THEY'VE BEEN REDUCED 8 TIMES IN 10 YEARS"
250 KW hrs. ~~$10.50~~ $6.84
100 KW hrs. ~~$5.00~~ in 1927 now $3.59
"MY! THIS IS A BARGAIN!"
"THE BEST BARGAIN I'VE SEEN"
"MAMA! WE WANNA SEE REDDY"
PRICES CUT 30% TO 60% IN 10 YEARS

"YES, FOLKS," SAYS REDDY KILOWATT,

"EIGHT RATE REDUCTIONS

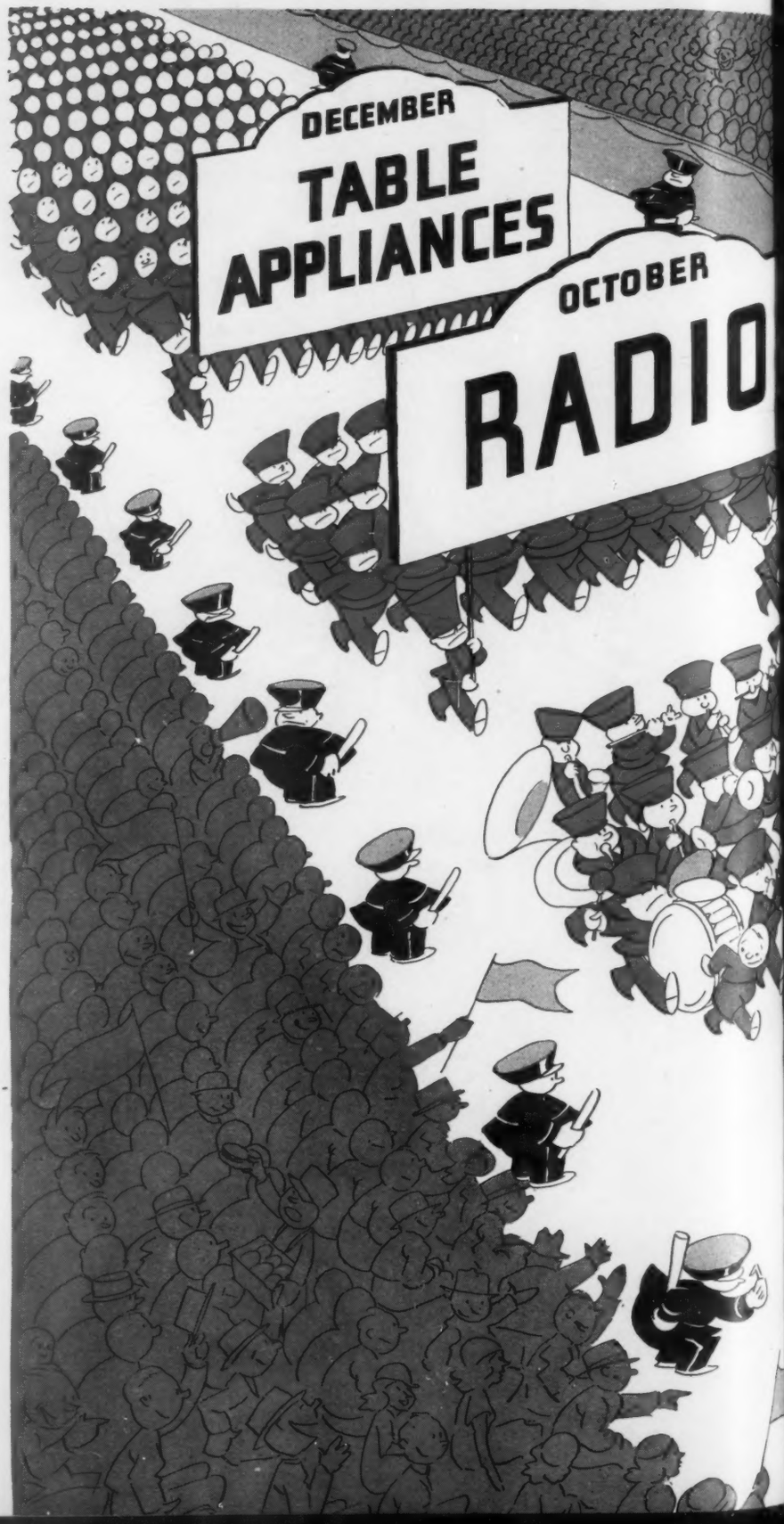
IN TEN YEARS, IS A RECORD I'M PROUD OF .... YOU SAVE FROM 30% TO 60% NOW."

	COST OF ELECTRICITY						
	25 KW-hrs.	50 KW-hrs.	75 KW-hrs.	100 KW-hrs.	150 KW-hrs	200 KW-hrs.	250 KW-hrs.
DOMESTIC RATES January 1927	$2.00	$4.00	$6.00	$8.00	$11.50	$15.00	$18.50
REDUCTION July 1927	1.88	3.65	5.40	7.15	10.40	13.65	16.90
REDUCTION April 1928	1.68	3.18	4.68	6.18	9.18	12.18	14.68
REDUCTION May 1929	1.68	3.18	3.93	4.68	6.18	7.68	8.68
REDUCTION April 1931	1.65	3.09	3.84	4.59	6.09	7.59	8.59
REDUCTION March 1935	1.54	2.76	3.51	4.26	5.76	7.26	8.26
REDUCTION January 1936	1.49	2.61	3.24	3.86	5.11	6.36	7.36
REDUCTION November 1936	1.46	2.53	3.16	3.78	5.03	6.28	7.28
Since March 15th 1937	1.39	2.34	2.97	3.59	4.84	6.09	6.84

SAN DIEGO CONSOLIDATED GAS & ELECTRIC COMPANY

HERE THEY

MORE MONEY MAKING OPPORTUNITIES FOR ELECTRIC DEALERS IN P. G. & E. TERRITORY



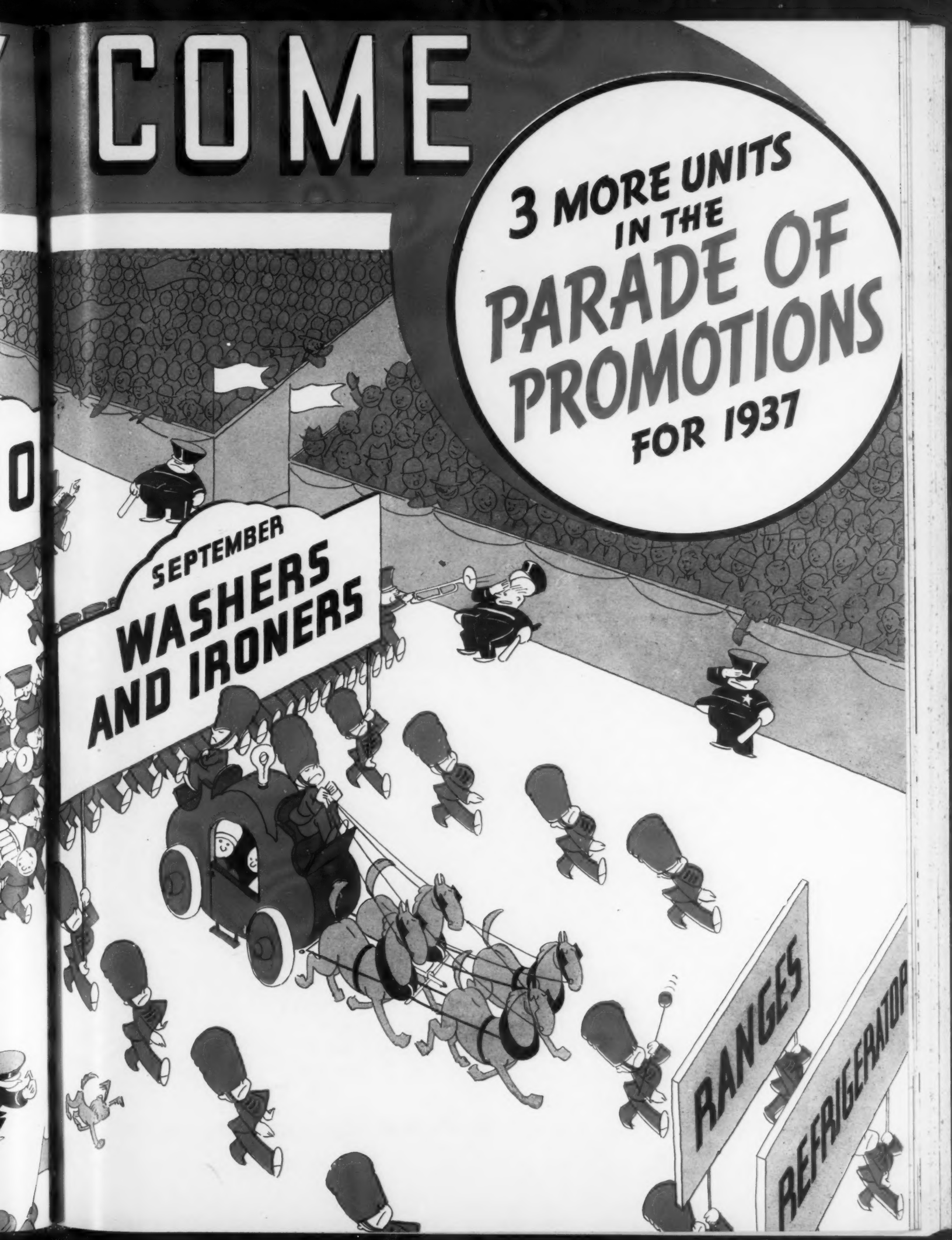
● **THE PARADE OF SALES PROMOTIONS agreed upon for 1937 is moving forward without a hitch. Two divisions—electric refrigerators and ranges—have already passed. Three more—home laundry equipment, radio and small appliances are rapidly approaching and dealers who intend to participate are already thinking of ways and means of tying in. If you are interested in more sales through concerted, organized, "united industry" selling, you will have your stocks in order and your advertising in shape for publication on the very first day of each campaign. If you are new to this "united industry" technique, we suggest that you investigate the results of previous campaigns. These results prove that selecting a particular appliance and then joining forces in a mass attack DOES produce business . . . . *and in profitable ratio to the time and money expended!***

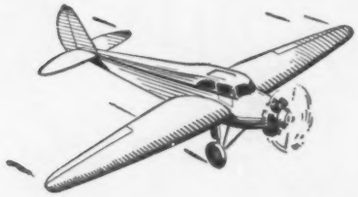
P·G·and E·

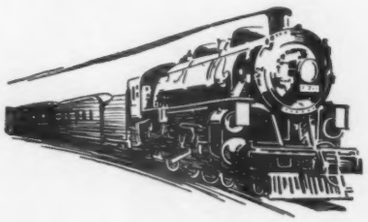
CIFIC GAS AND
ECTRIC COMPANY

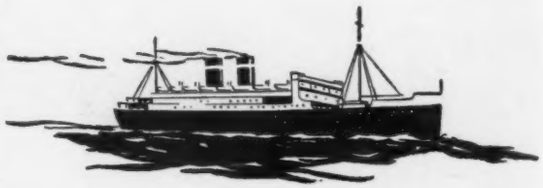
Operated · Managed by Californians

GOLDEN GATE INTERNATIONAL EXPOSITION 1939


COME
3 MORE UNITS
IN THE
PARADE OF
PROMOTIONS
FOR 1937
SEPTEMBER
WASHERS
AND IRONERS
RANGES
REFRIGERATOR







By Air -- By Land -- By Water --

IT was five years since the last P. C. E. A. Convention. Was the time right for another? Did the industry want one? DID THEY! They were seen arriving by every known method of transportation except hitch-hiking and it is rumored that some came that way. Over seven hundred delegates spent two days in an atmosphere of industry progress and development—and went home with a renewed vigor and interest in their jobs.

The next big events will be the Fall Conclaves, one in San Francisco and one in Los Angeles. If you are not already a member of the P. C. E. A. you'd better join now; it's the industry's band wagon and it's going places.

2,768 MEMBERS AS OF TODAY . . . ARE YOU ONE OF THESE LIVE WIRES?

PACIFIC COAST ELECTRICAL ASSOCIATION, INC.

447 Sutter St., San Francisco ★ **601 W. Fifth St., Los Angeles**

AHOY!
NOW'S THE TIME TO GET ABOARD
This good ship is going places
Just the places you like.
Permits Reaching New High
Community Is Confronted With Shortage of Houses
SALES CLIMB
NEW BUILDING IS FRATERNITY GOAL

RIDE THE HIGH TIDE OF BUILDING

Get in on the good times that are sure to follow the consolidation of the great National Sales Campaigns* into one combined sales effort.

The most intriguing opportunity in the history of the industry. A complete electric service for the home.

There's room for everybody.

"Allaboard!"

* **FIVE GREAT NATIONAL CAMPAIGNS**

1. Red Seal.
2. Better Light-Better Sight.
3. Kitchen Modernization.
4. Electric Water Heating.
5. Air Conditioning—National Committee.

SAN JOAQUIN POWER

SAN JOAQUIN LIGHT AND POWER CORPORATION

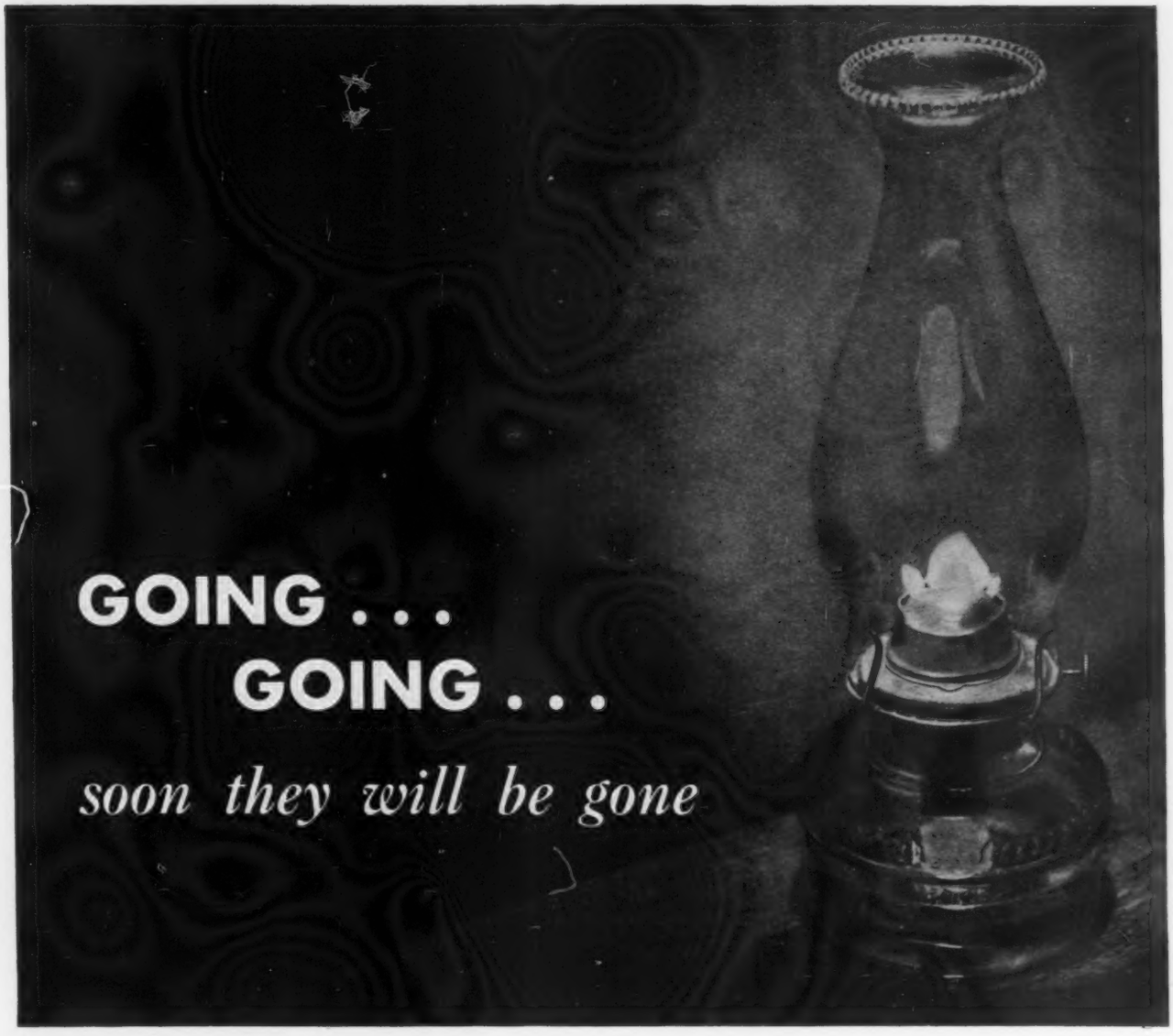
Co-operation will Keep the Northwest Electrical Industry a

GROWING BUSINESS

★ Like a sturdy tree with its many branches, the Northwest Electric Light and Power Association seeks to develop and promote all the branches of electrical industry in the Northwest. By nature, this association thrives best when every individual in the industry participates in its activities. Greater individual co-operation means a more profitable harvest-sales, profits, wages, and community development included. So, if you live in Washington, Oregon, Utah, Montana, Idaho or British Columbia, help to keep the electrical industry of these areas growing. To obtain your membership write . . . . .

NORTHWEST ELECTRIC LIGHT and POWER ASSOCIATION

707 Spalding Building **Portland, Oregon**



ELECTRICITY is going to work for the rural population. The thousands of miles of electrical lines which are now being installed require the use of nearly every type of electrical wire and cable. Engineering problems have made new designs necessary to meet varying conditions.

We have been making electrical wires and cables for many, many years. During that time most of the problems of electrification have been put before our engineers. Our experience and research facilities combined have been successfully called upon in the development of new materials to meet changing requirements.

Look to the American Steel & Wire Company for electrical wires and cables of every description. Our reputation for quality has been built on more than a century of wire-making experience. We welcome the opportunity to be of practical assistance to you in working out your needs for electrical wires and cables, and we are able to supply these needs with products that will give complete service and economy.

American Steel & Wire Company Products for Rural Electrification Projects

Galvanized Steel Conductors · Guy and Messenger Wire · Bare Copper Wire and Strand · Reliance URC Weatherproof Wire · Copperweld-Copper · Service Entrance & Drop Cables · Underground High Voltage Primary Cables · Overhead Concentric Cables · Rubber Covered Wires

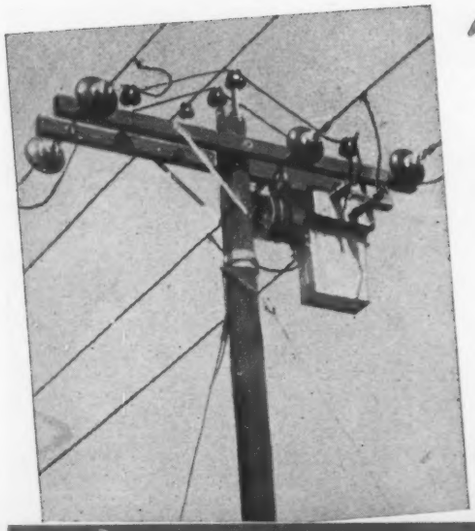
ELECTRICAL WIRES AND CABLES

COLUMBIA STEEL COMPANY · *San Francisco*

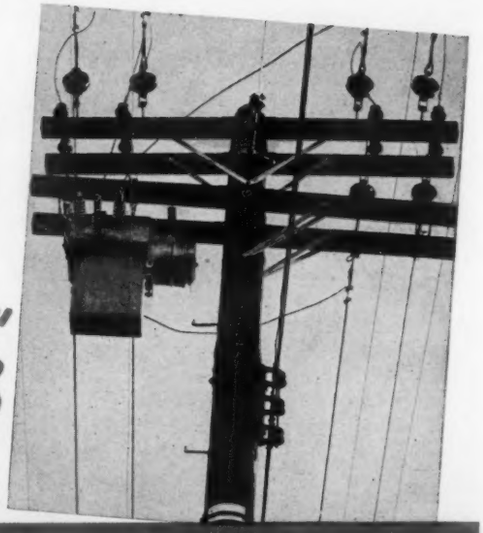
Pacific Coast Distributors of Electrical Wires and Cables for American Steel & Wire Company

United States Steel Products Company, New York
Export Distributors

UNITED STATES STEEL



"Fits Rural Line Budgets"



PACIFIC ELECTRIC AUTOMATIC SERVICE RESTORER

IMPROVES SERVICE
REDUCES MAINTENANCE
LOWERS COST

For dependable overload protection on rural lines, scores of utilities use the Pacific Electric Automatic Service Restorer. Its design permits easy installation and provides low cost maintenance by eliminating the necessity of replacing parts in order to restore service.

Customers rarely realize that an interruption in service has occurred when Pacific Electric Restorer is on the job. It clears shorts effectively and restores service automatically without using any auxiliary power.

You, too, can improve your rural line service and save money by specifying this protecting device—priced to fit rural line budgets. Why not let us tell you of its features? Without obligation of course.

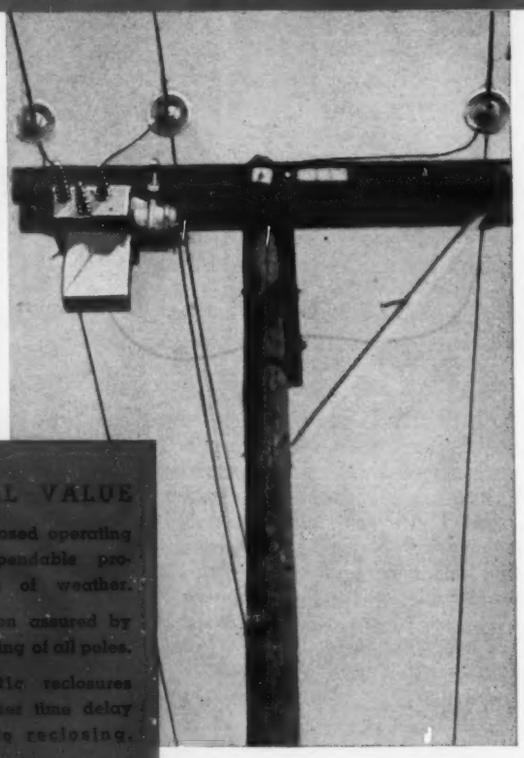
WRITE FOR BULLETIN NO 47

It fully describes the construction and explains the advantages you will enjoy by installing Pacific Electric Service Restorer.

Top Left: In New Mexico this Service Restorer is protecting equipment and assuring service.

Top Right: Service Restorer installed on the lines of a leading utility out in Arizona.

At Right: Type A P—I Service Restorer on the job in the heart of San Joaquin Valley, Cal.



HERE'S REAL VALUE

- Completely enclosed operating parts assure dependable protection regardless of weather.
- Greater protection assured by simultaneous opening of all poles.
- Three automatic reclosures adjustable for either time delay or for immediate reclosing.
- Positive Tripping at low currents — trips on ten amperes.

Pacific Electric Mfg. Corp.

5815 Third St., San Francisco, Calif. Dunes Highway, Gary, Indiana

An Important Moment

IN THE MAKING OF

Roebling Paper Insulated Cables

THIS reel of paper insulated cable is going down into the vacuum tank, where air and moisture will be eliminated to assure thorough impregnation. Following the CO_2 treatment, the impregnating oil is admitted to the tank to effect thorough filling of the paper insulating wall. The impregnated cable is thoroughly cooled in the insulating compound prior to withdrawal for the application of the lead sheath.

Typical of every operation at Roebling, this process must meet our own high standards of manufacture. The finished cable meets the standards of the High Tension Cable Committee of the Association of Edison Illuminating Companies.

Roebling Type H Impregnated-Paper-Insulated Cables with graded insulation are made in single and multiple conductor constructions. Lower voltage cables are unshielded.

JOHN A. ROEBLING'S SONS CO.

San Francisco Seattle Los Angeles Portland

ONLY A FINE PRODUCT MAY BEAR THE NAME ROEBLING

VARNISHED CAMBRIC • RUBBER POWER CABLES • BUILDING WIRE • RADIO WIRES • SIGNAL CABLE • FLEXIBLE CORDS • LEAD ENCASED AND PARKWAY CABLES • ARMORED CABLE

CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • BARE WIRE

The Department of the Interior Building
Washington D.C.

BUILT TO ENDURE

Electrical Contractor
H. P. Foley Co., Washington, D. C.
General Contractor
Geo. A. Fuller Co., New York, N. Y.

This Magnificent Building Wired Throughout with

CRESCENT ENDURITE
WIRE and CABLE

CRESCENT ENDURITE Rubber Compound is a super-aging, heat-resistant insulating material which exceeds Federal Specifications JC-106, required by the Government for installation in permanent Federal buildings.

Due to its superior heat resisting and high dielectric characteristics, it is especially suited for use when electrical conductors are required to meet abnormal temperature and aging conditions.

CRESCENT
INSULATED WIRE & CABLE CO. INC
TRENTON, NEW JERSEY

WESTERN REPRESENTATIVES

LOS ANGELES
Henger-Seltzer Co.
130 S. Hewitt St.

SAN FRANCISCO
Hodges & Glomb
1264 Folsom St.

KANSAS CITY, MO.
W. F. Howe & Co.
526 Law Bldg.

CRESCENT ENDURITE SUPER-AGING INSULATION • WEATHER-PROOF WIRE

The Only ALL-IN-ONE TRANSFORMER

WHEN you buy a transformer, you want the transformer that gives the most in quality, service and reliabilty. Besides the ordinary things you have come to expect in good transformers, there are certain other essential features necessary for best transmission and distribution practice. Some transformers have some of these features, but the only transformer that has all of these features is the Allis-Chalmers "All-in-One" Power Transformer.

These features include circular coils, shielded construction for moderate and high voltages, internal leads encased in machine-wound tubing, no load tap changer on side of case, combined expansion tank and large diameter relief device, unidirectional breathers, oil sealed inert gas protective system, magnetic oil-level indicators, and seepage-proof welds tested at high pressure.

Typical Transformer for an Industrial Sub Station.

754

TRANSFORMER DIVISION

ALLIS-CHALMERS

MILWAUKEE WISCONSIN

One of six TEXACO STARFAK-lubricated U. S. Motors which drive pump units in the City of Vernon Department of Power and Light.

THERE'S a TEXACO product especially developed to meet every power-plant lubrication need. Behind it is exhaustive engineering research, rigid laboratory specifications, and pitiless right-on-the-job testing to *prove* its stamina. ★ For instance, TEXACO STARFAK is the lubricant for power plant auxiliary motors with grease-type bearings. TEXACO engineers built STARFAK to withstand more punishment than you'll EVER give it!

THE TEXAS COMPANY • A CALIFORNIA CORPORATION

Other **TEXACO POWER PLANT LUBRICANTS**

TEXACO REGAL OILS
TEXACO URSA OILS
TEXACO MARFAK

TEXACO STARFAK

WHY THE L-M SPHEROLITE LUMINAIRE WILL GIVE YOU BETTER STREET LIGHTING AT LOWER COST

★

More Light Per Watt . . . New, deep design Alzak Aluminum Reflector bends all upcast light downward to the street.

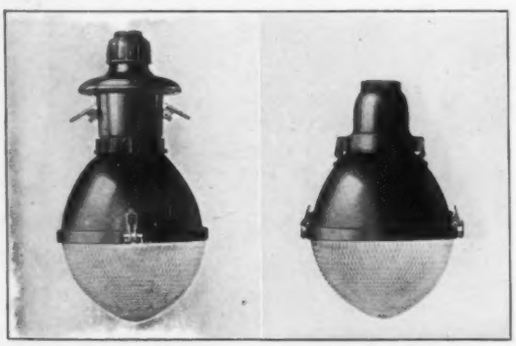
Glare Eliminated . . . The light source is completely concealed.

Clean Appearance. . . Glassware on every SPHEROLITE is self-cleaning L-M Diamond Mesh.

Wide Adaptability. . . Available in three types for medium screw, mogul multiple, or series sockets.

Lower Operating Cost. . Detachable Glassware replaceable in the field. Unit is light weight, dust and weather-proof.

SPHEROLITE
One Piece Spinning



SPHEROLITE with Metrolite Head

SPHEROLITE with Deep Canopy

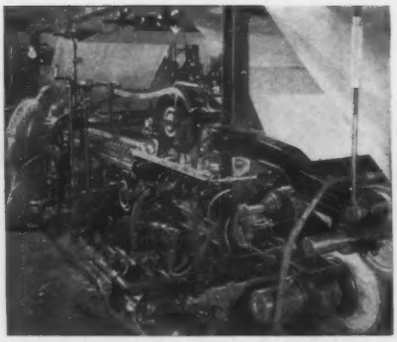
Get more efficient, more modern street lighting for your investment with L-M SPHEROLITE. Write to your nearest Line Material Co. Office for information.

LOS ANGELES, OAKLAND, PORTLAND, SPOKANE

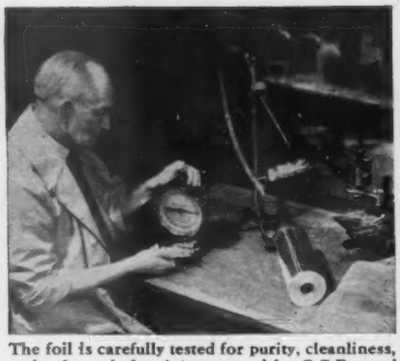
LINE MATERIAL CO.

BUILDING RELIABILITY

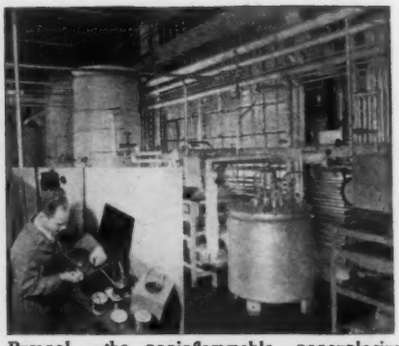
into G-E Distribution Capacitors



High-quality materials are the first requirement of a reliable capacitor. Thin Kraft paper is manufactured to our own rigid specifications on the most modern of paper-making machines



The foil is carefully tested for purity, cleanliness, and softness before it is accepted for G-E Pyranol capacitors



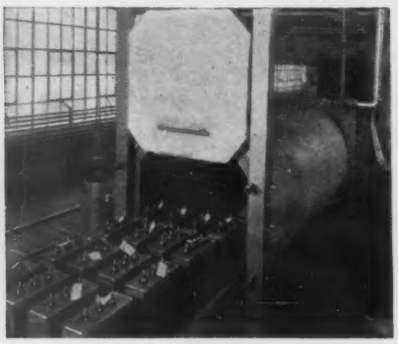
Pyranol — the noninflammable, nonexplosive liquid — is carefully refined and stored under vacuum. Characteristics are checked, just before use, for final assurance

Careful manufacture is essential, and winding is the first step. Specially developed machines and experienced operators wind the foil and paper together

The completed rolls are placed in their containers and the cover is fastened. All seams are double rolled, assuring tightness and strength

Then the leads are pulled through and sealed to the bushings. The leads being taut, the possibility of internal short circuits and grounds is eliminated

Treating the assembly with Pyranol is painstakingly careful—it takes *a week*—and all operations are conducted under the most rigidly controlled conditions



Tests for quality are made after each step. This test checks the hermetically sealed units for leaks

And the final test is electrical—to make certain that the units measure up to operating requirements

PYRANOL capacitors are manufactured by an organization whose long experience has amply qualified it to build capacitors that meet the requirements of utility service. For proof of the reliability of these units, consider a service record that is 99.83 per cent perfect. General Electric, Schenectady, N. Y.

360-123

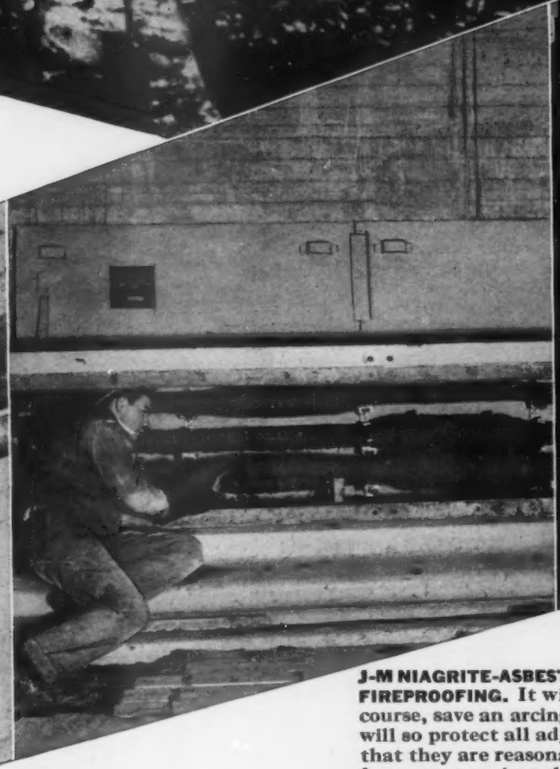
GENERAL ELECTRIC

UNIFORM SERVICE IN 48 STATES . . . another high spot in
TODAY'S TREND TOWARD
PYREX
POWER INSULATORS
PYREX is a Trade Mark and indicates manufacture by Corning Glass Works, Corning, N. Y.

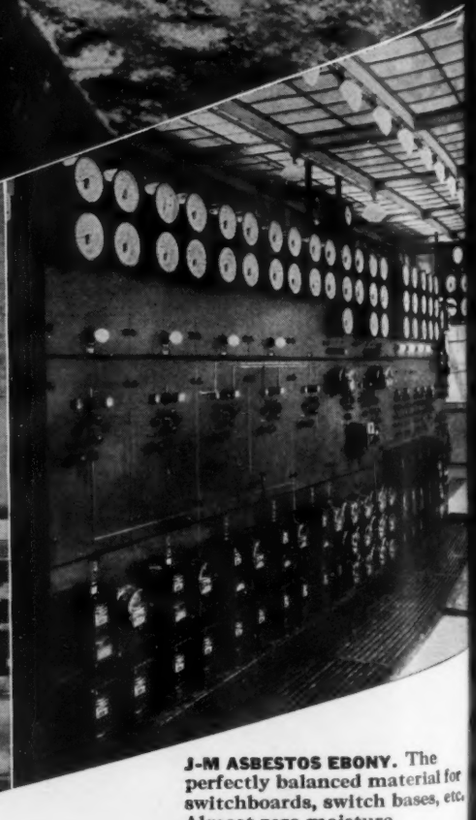
Cutting Distribution

J-M TRANSITE CONDUIT. This asbestos-cement product is strong enough to be installed *without* an envelope. Hence it eliminates concreting costs and effects immediate, large savings. Corrosion-resistant, immune to rot and decay, it is ideal for exposed locations, too—for it is incombustible, weatherproof. On every job, its durability means lasting service at negligible upkeep.

(Below) **J-M TRANSITE KORDUCT.** Differing from J-M Conduit only in lesser wall thickness and lower cost —Korduct is the conduit to use when "concreting-in" is required. Its light weight and long lengths decrease handling and installation costs.



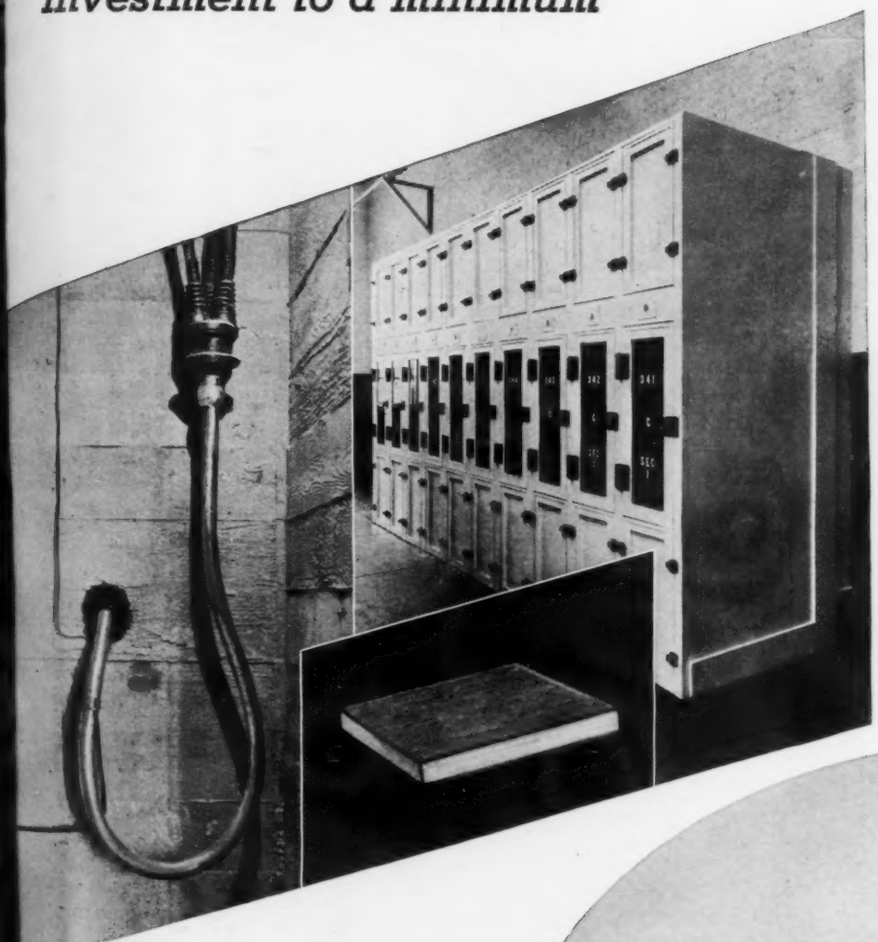
J-M NIAGRITE-ASBESTOMENT CABLE FIREPROOFING. It will not, of course, save an arcing cable, but it will so protect all adjacent cables that they are reasonably secure from communicated damage. No other system affords like protection; none so easy or economical to apply.



J-M ASBESTOS EBONY. The perfectly balanced material for switchboards, switch bases, etc. Almost zero moisture absorption; high dielectric strength and surface resistance. Light, workable, but strong. Unaffected by rapid temperature changes or mechanical shock.

Costs *to the Bone*

Here are 6 Johns-Manville Electrical Products differing in their application, but designed with one common objective: *To reduce your distribution investment to a minimum*



(Above, left) **J-M DUXSEAL.** A plastic, non-hardening putty for superior sealing of duct openings from manholes to basements, to lighting standards, etc. Unharmed by temperature change, gases, condensates, ground waters.

(Above, right) **J-M TRANCELL.** A new and greatly improved material for cell structures, partitions, etc. . . . and wherever used, it is an excellent fire barrier. When faced both sides with a Transite-like material, J-M Trancell is pre-eminently suitable for doors. Light weight, great structural strength, fine appearance and ease of installation are among its many outstanding characteristics.

MEN interested in *paring* distribution costs . . . without *impairing* operating efficiency . . . would do well to study the products pictured on these two pages.

In their mineral composition, and in their design as well, these J-M Electrical Products offer a genuine solution to the ever-present problem of lowering distribution costs . . . and *keeping* them low.

With the exception of Duxseal, all are mineral. All representative of the experience gained in half a century of making materials of mineral origin into finished products of time-proved durability.

Moreover, on the services for which these Johns-Manville Products are specifically designed, they are so highly resistant to fire and other destructive elements as to be virtually imperishable . . . hence practically maintenance-free. And because they are all distinguished by a marked ease and simplicity of application, their use effects savings for you right at installation.

The consequent economies . . . in reduced operating and maintenance charges . . . that follow through the years, warrant detailed investigation on your part. May we present all the facts? Simply address Johns-Manville, 22 E. 40th St., New York City.

JOHNS MANVILLE JM PRODUCTS

Johns-Manville ELECTRICAL PRODUCTS

PRINT IN BINDING

NOW··· ANOTHER TRIBUTE TO SIGHT-CRAFT QUALITY

First PACIFIC COAST MANUFACTURER TO BE AWARDED RLM LABEL

Sight-Craft industrial reflectors have consistently met the exacting requirements of industrial buyers in *national* competition—the result of Smoot-Holman's engineering background and experience in good lighting practice plus proven ability and modern manufacturing equipment.

NOW. . . in recognition of *consistency* of superior quality and a further assurance of efficient and effective lighting . . . Smoot-Holman announces the RLM LABEL on SIGHT-CRAFT REFLECTORS.

Thus SMOOT-HOLMAN *streamlines* the selling advantages of its *proven* SIGHT-CRAFT industrial reflectors—which are:

1. RLM LABEL . . . your assurance of
   - a balanced lighting
   - b low replacement and maintenance cost
   - c uniform quality
2. SIGHT-CRAFT emblem . . . your guarantee of
   - a proven quality
   - b "VITROLUX" everlasting enamel finish
   - c prestige and acceptance
3. SMOOT-HOLMAN manufacture . . . embracing
   - a modern equipment
   - b pride of manufacture
   - c individual ownership and supervision
4. QUICK DELIVERIES . . . from warehouse stocks in strategic points throughout the entire United States.

Ask For SIGHT-CRAFT RLM REFLECTORS

Send for catalog ELW 637 showing the complete line of SIGHT-CRAFT Commercial and Industrial Lighting

★

STOCKS CARRIED IN
NEW YORK · BOSTON · ST. LOUIS
SEATTLE · INGLEWOOD
HOUSTON · SAN FRANCISCO

SMOOT-HOLMAN COMPANY
SIGHT-CRAFT
INGLEWOOD CALIFORNIA

SMOOT-HOLMAN COMPANY

SAN FRANCISCO
33 Dore Street

INGLEWOOD, CALIFORNIA

NEW YORK
10 Jones Street

THE

Fast-moving

LINE IN A

Fast-growing

BUSINESS!

FASTER SALES INSURE GREATER PROFITS

● Many easily-demonstrated features make the Norge Electric Range easy to sell. Few basic models with many available selective features make up a line that is easy to sell *at a profit.* Sales records this year prove it!

Back of this profit-making line of fine ranges is an aggressive, well-planned promotion and advertising program — the greatest in all Norge history. Promotion and advertising activities are stimulating sales — increasing both prospects and profits. The big opportunity is at your door —*now*. Get in touch with the Norge distributor in your territory—get the details of the Norge line, promotion program and liberal finance plans. Act now.

NORGE DIVISION *Borg-Warner Corporation*
606-670 E. Woodbridge St., Detroit, Michigan

NORGE ELECTRIC RANGES

ANOTHER NORGE VITAL VALUE THAT SELLS ITSELF!

● Broiler on larger models is adjustable from outside, equipped with Chrome pan and grill. The high powered element insures faster, more efficient broiling. Typical of many easily-demonstrated, super-quality features in Norge Electric Ranges.

ER-4

NORGE

Plus Value Home Appliances

ROLLATOR REFRIGERATION (DOMESTIC AND COMMERCIAL)
GAS AND ELECTRIC RANGES • WASHERS AND IRONERS
WHIRLATOR OIL BURNERS • GAS BURNERS • FINE-AIR FURNACES
COAL STOKERS • AIR CONDITIONING • CIRCULATOR ROOM HEATERS

THE VALUABLE WOOLWINE FRANCHISE BECOMES STILL MORE VALUABLE

UNPRECEDENTED DEMAND BEING MET BY INCREASED PRODUCTION SCHEDULE

K. T. NORRIS

President of the Norris Stamping & Manufacturing Company

ANNOUNCES

The Purchase of the Woolwine Metal Products Company, Manufacturers of Woolwine Electric Ranges and Water Heaters

THE WOOLWINE-NORRIS CORPORATION

Will be the new name of this pioneer Southern California Manufacturing Concern

SUBSTANTIAL INCREASE IN CAPITALIZATION AND IMPROVED PRODUCTION FACILITIES SUPPORT WOOLWINE ELECTRIC RANGES

In six short months Woolwine has become Southern California's Number One electric range. Now, progress will be furthered by a wealth of manufacturing experience and substantial financial support. This support, combined with a proven product and a record-breaking merchandising campaign, assures the dealer of increased demand for the product, adequate production to meet the unprecedented demand, and continued policy of dealer protection.

THE WOOLWINE-NORRIS CORPORATION
Altantic Blvd. and So. Riverside Drive, Los Angeles, Calif.

THE VALUABLE WOOLWINE FRANCHISE BECOMES STILL MORE VALUABLE

WOOLWINE ELECTRIC RANGES

EASY'S EXCLUSIVE SALES FEATURES...

JUST LOOK AT THESE SIX OUTSTANDING ADVANTAGES! THEY MAKE EASY'S 1937 LINE THE PUBLIC'S FIRST CHOICE!

1 SPIRALATOR WASHES WHITER, FASTER, GENTLER. Patented new washing action gently flexes clothes back and forth, opening the thread-strands and flushing out all the dirt. Washes 50% more clothes per load without tangling. An exclusive EASY feature that licks competition.

2 TURBOLATOR WASHES QUICKER, CLEANER. Another patented EASY 3-Zone washing action . . . and it retails for less than $100! Keeps the clothes in constant action in all parts of tub . . . top, middle and bottom zones.

3 OUTSTANDING WRINGER SAFETY. EASY Wringers are safest in the world! Exclusive new release trips rolls at finger's touch, rolls stop revolving. Balloon wringer rolls. Self-reversing drainboard.

4 EASY DAMP-DRYER. Assures absolute personal safety. *Whirls* more water from clothes. Damp-Drys one batch while another is washed. Handles even pillows and blankets. Saves drying, mending, ironing, washing time.

5 EASY IRONERS OFFER EXCEPTIONAL VALUE. Attractive range of prices, models. Full 26" shoe. Thermostatic heat control. Finger-tip and adjustable knee controls. Swinging cabinet cover.

6 BEAUTIFUL MODELS IN WHITE. Some EASY Washer and Ironer models are finished in gleaming white . . . acknowledged by famous designers as the most popular for home laundries.

...Build extra profits for EASY DEALERS

EASY dealers make extra money on washer sales, because they sell a bigger percentage of higher-margin models than those who retail ordinary brands. Hundreds of EASY dealers make over 40% of sales on models $100 and up.

How are they able to do it? Because of EASY'S exclusive sales features! Read them in the panel to the left. Note how they indisputably put EASY quality head and shoulders above all others. EASY leads, too, in promotion and advertising cooperation.

Tested newspaper advertisements; an impressive window display service; folders, handbills, booklets and mailing pieces; complete demonstration and sales training material all support EASY dealers in getting their bigger share of the business.

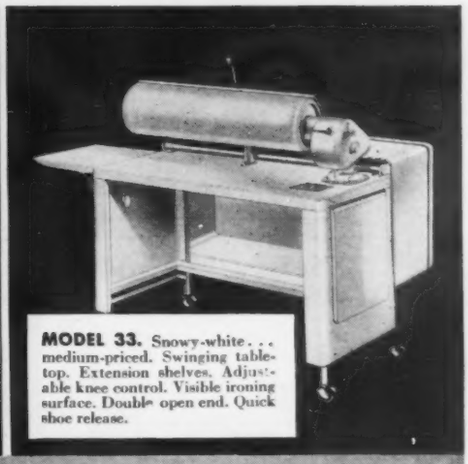
42% of his EASY Sales over $100

Introducing Mr. Julian Carash of J. F. Hink & Son, Berkeley, Calif. During 1936 his average retail sale on EASY Washers was $104.70. How does he do it? By selling EASY's exclusive, profit-making Sales Features. You, too, can make extra sales and larger profits by featuring EASY's outstanding advantages. Profit minded dealers everywhere are joining up. Write or wire for special EASY Profit Plan.

EASY WASHING MACHINE CORP.
SYRACUSE, NEW YORK

MODEL 1B. Snowy-white finish. Spiralator washing action . . . EASY Dual-Release Wringer that automatically stops rolls, throws them wide apart.

MODEL 5DS. Spiralator action combined with EASY Damp-Dryer. Assures absolute personal safety. Saves washing, needing time, and time on the line.



MODEL 33. Snowy-white . . . medium-priced. Swinging tabletop. Extension shelves. Adjustable knee control. Visible ironing surface. Double open end. Quick shoe release.

EASY WASHERS AND IRONERS

Hotpoint LEADS

A NEW BUILT-TO-THE FLOOR ELECTRIC RANGE

the CHESTERFIELD

Here's the ace that brings in the biggest market of them all—the medium-priced field. Here is a range with high-priced quality features without the high price. Here is striking, streamlined beauty—features that stamp the Chesterfield as a VALUE the moment you disclose it to your prospects—Full 39 in. width... Entire range in white porcelain... Stain-resisting one-piece top and back splasher... Extra-large, heavily insulated oven... 3 large easy-sliding storage drawers.

Look at the wealth of sales-closing features this new built-to-the-floor model brings you—everything from battleship construction to Hi-Speed Calrod Thrift Coils and the popular Hotpoint Thrift Cooker—feature after feature never before available in this price range.

Priced for Volume Sales

What an opportunity for alert merchandisers to cash in on the trend to electric cookery! A gigantic, unsatisfied market is ready for the Chesterfield NOW. More and more housewives are becoming convinced that their next range will be an electric. The Chesterfield gives them the beauty and quality features they have longed for, at the price they want to pay.

Don't neglect this tremendous waiting market. Get behind this Hotpoint achievement and watch your sales curve shoot straight upwards. Get in touch with your nearest Hotpoint representative today.

EDISON GENERAL ELECTRIC APPLIANCE COMPANY, INC. • 5612 WEST TAYLOR STREET • CHICAGO

Calrod GIVES WINGS TO SPEED COOKERY

Utility size gives users full 1200 watts. Giant size Calrod operates at full 2100 watts in service.

Hotpoint's Hi-Speed Calrod Coil is the fastest cooking unit the world has ever seen. Under every test conducted by our own engineers and by independent testing laboratories—under the most rigid standards—it has been proved that Hi-Speed Calrod has no equal for speed, durability, economy or efficiency.

These are broad statements, but they are proved statements. Recently Hotpoint was awarded the largest electric range contract ever placed—an order for 8480 ranges to be installed in P.W.A. low-rent housing projects. Hotpoint was awarded the contract on the basis of economy, long life and performance. Hotpoint was the only electric range chosen.

Hi-Speed Calrod will operate at its FULL rated wattage throughout its life-time—its capacity will not dwindle with age. This amazing unit is standard equipment on all Hotpoint ranges.

NEW *Sky Rocket* SUMMER CAMPAIGN

A complete sales promotion program to make this the biggest summer in the history of your business. Contests for your salesmen to bring out the best they have—tested, pulling direct-mail material that will be read and acted upon—lively newspaper advertising to spot prospects, bring them into your display room, and impel action—sales ideas that not only attract attention but create desire, create business, and increase profits. Here is a completely planned summer campaign and it's *free*. See your Hotpoint representative.

ELECTRIC **Hotpoint** RANGES

REFRIGERATORS • WATER HEATERS • DISHWASHERS • HOME LAUNDRY EQUIPMENT

GENERAL ELECTRIC . . . *presents*

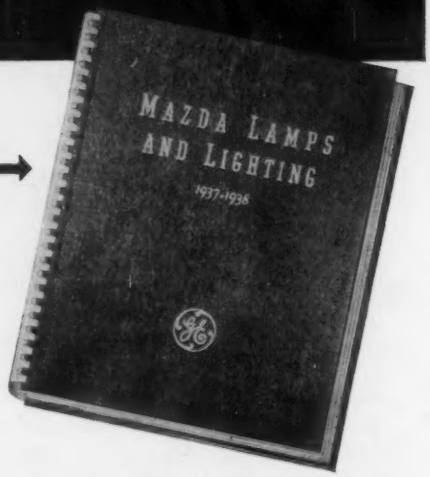
its lamp and lighting program for 1937-38

BETTER LIGHT-BETTER SIGHT

From a modest beginning in 1933, the Better Light-Better Sight Program, based on the Science of Seeing, has swept steadily ahead. In 1936, largely as a result of this program, lighting returned utilities more added gross and net than any other use of electricity.

Now, General Electric presents utilities with its lamp and lighting plans and materials for the fall of 1937 and spring of 1938. They are designed to make lighting more than ever the number one load builder.

VALUABLE NEW 58-PAGE BOOK COMPLETELY OUTLINES G-E'S UTILITY PROGRAM . . . .



General Electric's new book, "MAZDA Lamps and Lighting" for 1937-1938 is alive with valuable information and comprehensive plans for utilities. Every utility executive interested in building lighting load during the coming season will find this book very profitable. Highlights in this book include plans for:

1. Creating more 100% lighted homes . . . homes that produce 1000-1500 kwh. of lighting load per year . . . that will be "examples" for all local home lighting.

2. Gearing up for the sale of 100,000,000 I.E.S. Better Sight Lamps . . . the saturation of the market is only 3.4%.

3. Filling empty sockets—General Electric has prepared complete plans for effective campaigns . . . profitable to both the utility and the dealer alike.

In addition, the book contains charts showing load building prospects for homes, stores, offices, industries, schools, streets and highways and specific information on the opportunities ahead. Also complete data on how General Electric will promote and advertise lamps and lighting. PLUS a list and description of full supporting material that will be available.

Let us go over this book with you

● We should welcome the opportunity of having one of our representatives go over this book of plans with you at your convenience. Simply phone or write the General Electric Lamp Division serving you. General Electric Company, Dept. 166, Nela Park, Cleveland, Ohio.

GENERAL ELECTRIC

FRIGIDAIRE SALES BY UTILITIES ARE *again Breaking all Records!*

. . . BECAUSE ONLY FRIGIDAIRE HAS THESE IMPORTANT SALES ADVANTAGES!

ONLY FRIGIDAIRE HAS...

THE METER-MISER

Simplest refrigerating mechanism ever built . . . Cuts Current Cost to the Bone!

ONLY FRIGIDAIRE HAS... THE QUICKUBE TRAY

with the INSTANT CUBE-RELEASE

ALL-METAL FOR FAST FREEZING

● Month after month of 1937, Frigidaire sales have climbed higher and higher. All total sales records of the past have been supplanted by new high marks, and the peak is not in sight!

Mrs. America is buying Frigidaire in larger numbers than ever before! Demanding this refrigerator that gives her so many advantages found in no other refrigerator. Utilities handling Frigidaire are cashing in on this preference . . . in fact, are well on their way towards making 1937 the greatest refrigeration year in their history, bettering the record-breaking year of 1936 by a wide margin.

Read the list of salable features that *only* Frigidaire can offer, and you will know why Frigidaire, year in and year out, is the fastest-selling refrigerator in the world!

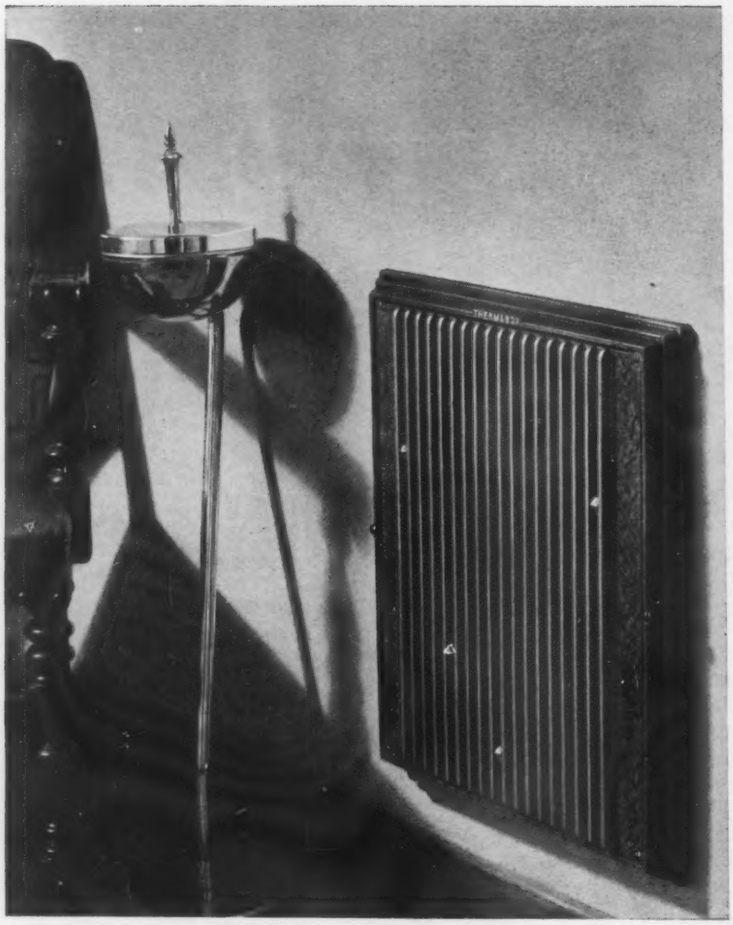
FRIGIDAIRE DIVISION
General Motors Sales Corporation · Dayton, Ohio

FRIGIDAIRE
MADE ONLY BY GENERAL MOTORS

Only Frigidaire has..

- **THE METER-MISER** — Simplest Refrigerating Mechanism ever built—only 3 moving parts, *including* the motor. *Exclusive!*
- **NEW ALL-METAL QUICKUBE TRAY** with the **INSTANT CUBE-RELEASE** — Quick release of ice-cubes in every tray of every model. *Exclusive!*
- **9-WAY ADJUSTABLE INTERIOR** — 2-Way Frozen-Storage Compartment · 2-Way Cold-Storage Tray · 3-Way Sliding Shelf · 2-Way Multi-Storage Section. *Exclusive!*
- **FOOD-SAFETY INDICATOR ON OUTSIDE OF DOOR** *Exclusive!*
- **AUTOMATIC TRAY-RELEASE** *Exclusive!*
- **F-114**... The Safe Low-Pressure Refrigerant. *Exclusive!*
- **PRODUCT OF GENERAL MOTORS** *Exclusive!*

YOU CAN DO STILL BETTER WITH FRIGIDAIRE IN '37!



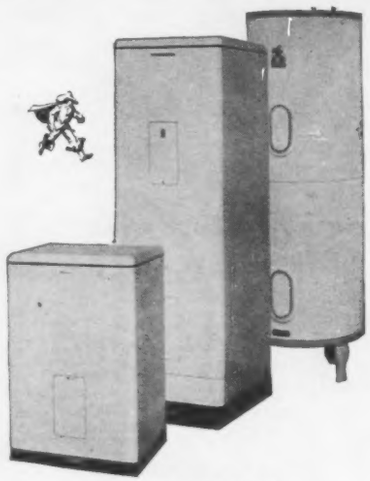
Artistically designed in the modern manner

Thermador
Electric ROOM HEATERS

Cool in Summer

Heat in Winter

Save the year round!

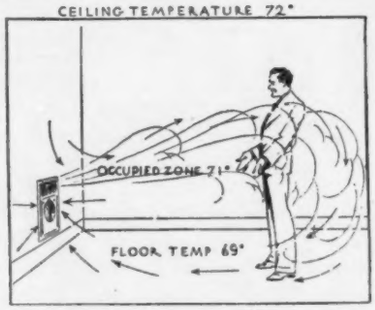


THERMADOR WATER HEATERS LEAD IN THE WEST

California homebuilders have installed more THERMADOR Electric Water Heaters than all other makes combined. The reason—advanced designs to meet utility specifications for economy, quality and efficiency. A complete line for every water heating requirement.

PROVEN leaders among fan-type heaters. Popular because of their all-purpose utility. At the click of a switch they will deliver quantities of clean, healthful warmth into the room during cold weather; circulate cool air in the room in the summer. Architects recommend them because of their smart styling. Owners like their long life and operating dependability. Ideal for bathrooms where adequate heat is a health essential.

Seven times faster heating in the "Living Zone"



Tests show that a Thermador heats seven times faster than other types. And because heat is gently circulated in the living zone, instead of in unoccupied portions of the room, you use less electricity. Compare with any other electric heaters and you'll decide on a THERMADOR.

Write for literature describing complete line of Thermador Electric Room and Water Heaters

Thermador Electrical Manufacturing Co.

2821 East Pico Blvd., Los Angeles
Builders' Exchange, San Francisco

1918 Lake Shore Ave., Oakland
1837 Merced Street, Fresno

QUALITY

the equal of regular Benjamin Floodlights

The Benjamin Variety-Lite brings to the home floodlighting market, a reflector whose durability and light diffusing qualities are of the same high quality standards as Benjamin's commercial type floodlight reflectors.

Like the commercial type Benjamin floodlight reflectors, Variety-Lite is made of highest quality Benjamin porcelain enameled steel. Weather-proof and durable, Benjamin porcelain enamel not only insures a life-time finish but also unexcelled light diffusing efficiency.

Manufactured to the same high quality specifications as are Benjamin's highest priced commercial type floodlights, Variety-Lite offers these additional quality features in a home floodlight unit: (1) Higher Lighting Efficiency; (2) Higher Reflection Efficiency; (3) Portability; (4) Modern Streamlined Design with new attractive color combination; (5) Adjustable Bracket; (6) Extra Length Extension Cord and Unbreakable Plug.

PORTABILITY

increases use and sales appeal!

The KEY to increased Home Floodlight Sales is a popular priced, quality unit which can be used for a variety of home floodlighting purposes. That is why the high quality Variety-Lite is not only popular priced but is also PORTABLE. In the purchaser's eyes, he gets MORE FOR HIS MONEY when he can use his floodlight unit for a variety of purposes instead of just one. Portability thus reduces the necessary total investment for home floodlighting, making it practical for homes and small businesses.

NEW *Improved* BENJAMIN VARIETY-LITE

SPECIAL

Introductory Sales Plan

A complete advertising program which includes counter cards, circulars, newspaper ads, and the Variety-Lite Demonstrator illustrated at right, is available for the use of Electrical Dealers and Power Companies. Details of this program may be secured by the return of the coupon or by writing the Benjamin Electric Mfg. Co., San Francisco, California.

TWO SIZES

Variety-Lites are made in two sizes for 100 Watt and 200-300 Watt Lamps and are individually packaged in attractive cartons.

The KEY *to* INCREASED SALES *of* HOME FLOODLIGHTS *and* LAMPS

Already the public is floodlight conscious. Ready to floodlight for PROTECTION, RECREATION and DECORATION. All the public has been waiting for is a more practical floodlight unit. The Benjamin Variety-Lite is IT! A popular priced unit with the same profit margins as the regular Benjamin Floodlights!

Mail this Coupon

FREE Portfolio

Benjamin Electric Mfg. Co.
San Francisco, California

Rush Variety-Lite Portfolio containing details of SPECIAL INTRODUCTORY SALES PLAN.

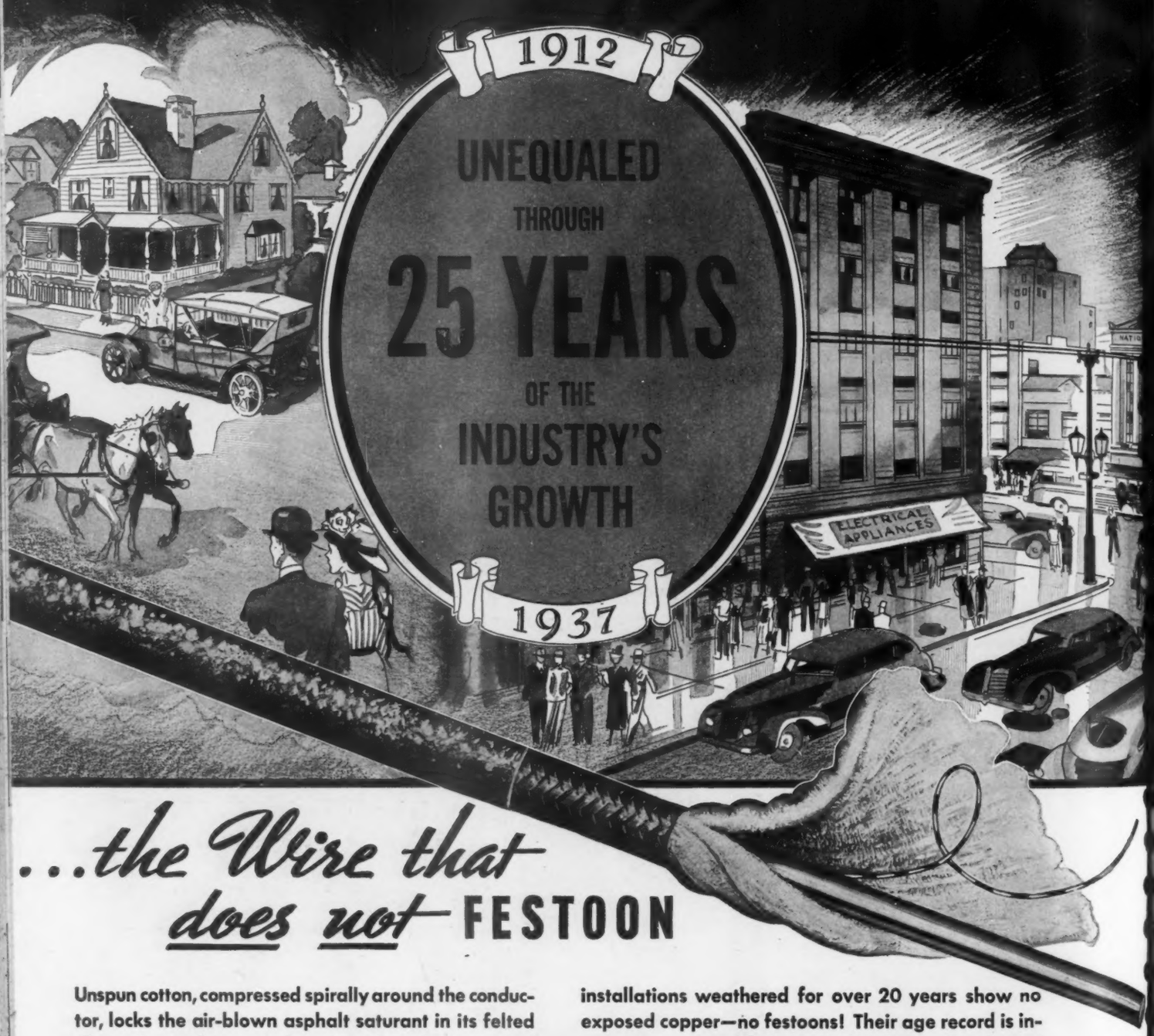
Name_____

Address_____

City_____ State_____

BENJAMIN LIGHTING EQUIPMENT
Distributed Exclusively Through Electrical Wholesalers

"PEERLESS"
WEATHERPROOF

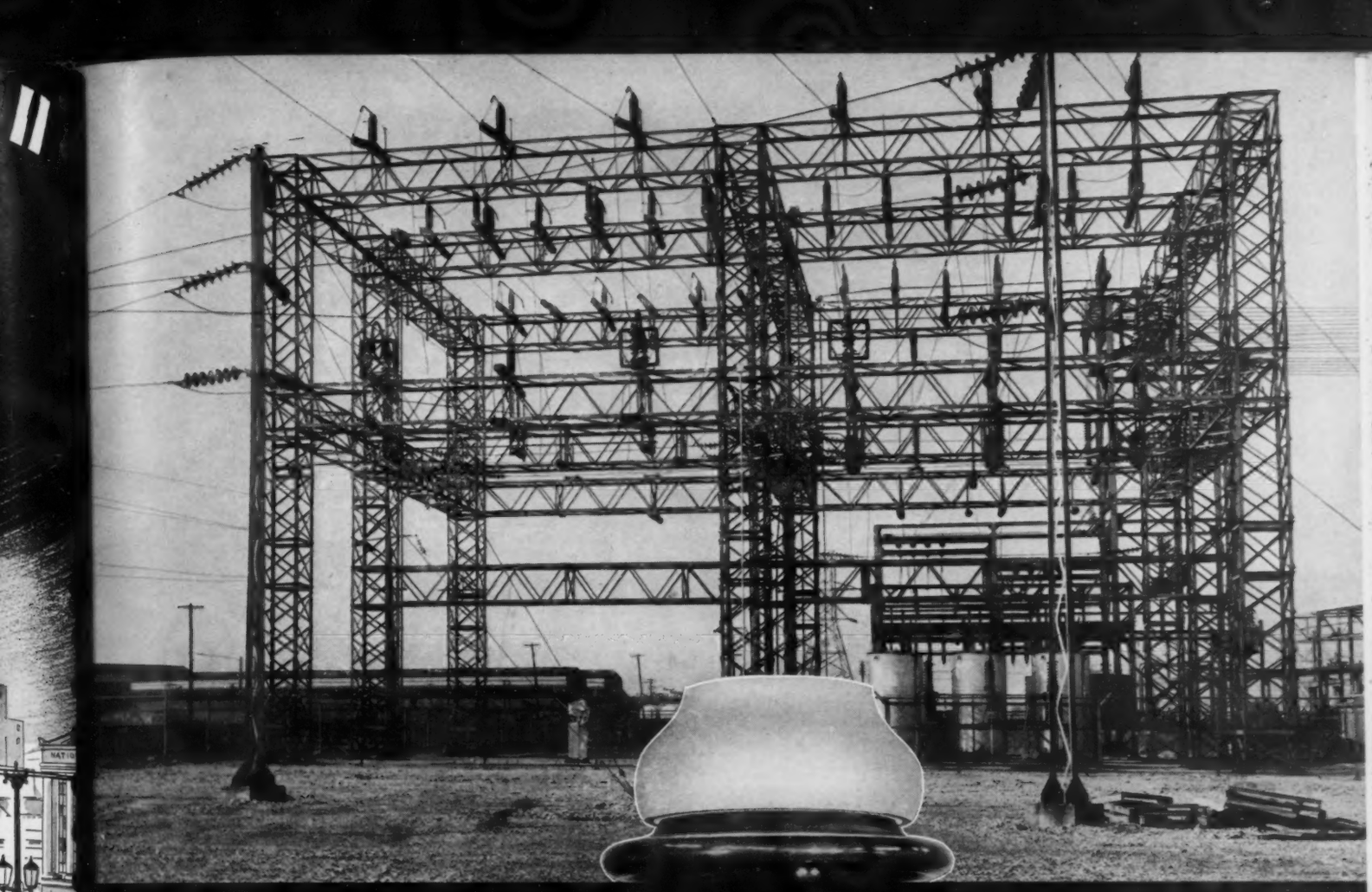


...the Wire that *does not* FESTOON

Unspun cotton, compressed spirally around the conductor, locks the air-blown asphalt saturant in its felted fibers. Even after years have weathered away the finishing wax and outer braid, the inner cotton-fiber construction retains its saturant, as a homogenous sheath **WHICH DOES NOT FESTOON.** Samples from installations weathered for over 20 years show no exposed copper—no festoons! Their age record is indisputable. Look for the marker thread which codes each year's manufacture. You probably have some Peerless on your own lines. Examine its condition; check its age—**AND YOU'LL SPECIFY PEERLESS.**

GENERAL CABLE CORPORATION

Sales Offices: ATLANTA · BOSTON · BUFFALO · CHICAGO · CLEVELAND · DALLAS · DETROIT · LOS ANGELES · NEW YORK · PHILADELPHIA · PITTSBURGH · ROME · SAN FRANCISCO · ST LOUIS · SEATTLE · WASHINGTON, D.C.



TO HANDLE DIRT CONDITIONS . . . . THE Lapp Station Post

Its ability to resist flashover under the severest of contaminated atmosphere conditions made the Lapp Station Post the natural choice of designing engineers for this 66Kv. industrial substation. Wherever smoke, dust, fumes or salt air are an important consideration, the Station Post is a ready answer. But in addition to this marked advantage, the Station Post brings to every installation other superiorities—freedo from puncture and crackii —ability to withstand arcov and mechanical attack—u matched rigidity and invert or oblique mounting streng —greater resistance to impa —sturdy handsome appea ance. Learn more about t Station Post. A copy of La Bulletin 123 will describe features to you.

MAYDWELL & HARTZELL, IN
SAN FRANCISCO . . . . . LOS ANGE

LAPP INSULATOR CO. INC

LAPP INSULATORS

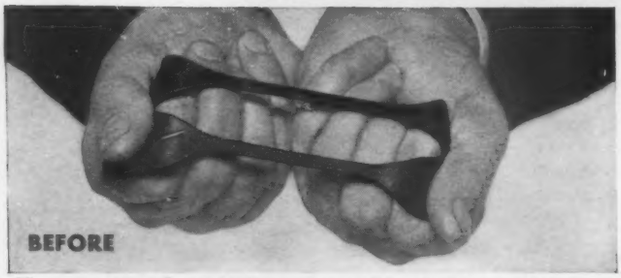
LE ROY - N.Y. - U.S

CORONOL

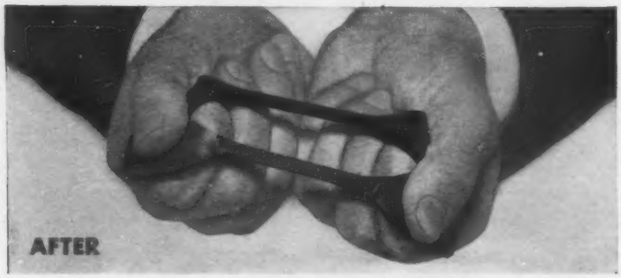
Even After Aging Tests

Stands 300 Hours in Ozonator

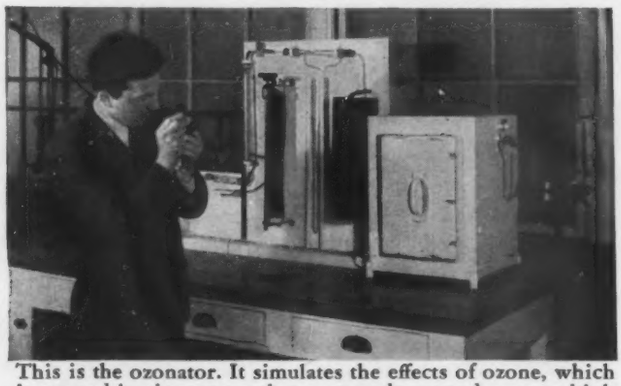
PROVES THAT IT IS A SUPERIOR RUBBER INSULATION FOR HIGH-VOLTAGE CABLE



Here are two dumb-bell samples of insulation: At the top, Coronol; at the bottom, ordinary rubber.



Here are the same two samples after being subjected to a .03% ozone concentration. See the cracks in the ordinary rubber (at bottom) after 1½ minutes. The Coronol was exposed for 300 hours.



This is the ozonator. It simulates the effects of ozone, which is created by the corona that surrounds a conductor at high voltage.

IT'S amazing how ozone attacks rubber. You'd never believe the results unless you saw them with your own eyes. Almost instantly, the rubber starts to crumble and soon turns into a substance that looks like dried-up putty . . . and has about the same insulation value.

Ozone is, of course, created by the corona that surrounds a conductor carrying current. The higher the voltage, the more corona, and of course the greater the concentration of ozone. A .03% concentration is a lot—much greater than that encountered in actual service and three times that used in making recognized standard corona-resistance tests.

First Aged for 90 Days

Samples of cable insulated with Coronol, as well as with other rubber and rubber-like compounds, were first aged in the Geer oven at 70 C for 90 days. The were then put in the ozonator and subjected to a .03% concentration. They were examined frequently; and one by one they failed and were taken out. This kept up until only the Coronol samples remained. At the end of 300 hours, the test was stopped—because even then nothing had happened to the Coronol.

In addition, Coronol also has good moisture-resisting, dielectric, and long-life properties.

Coronol for Low-cost High-voltage Circuits

You can depend on Coronol insulated cable to give long-time service for circuits from 2300 to 15,000 volts. *It will hold up.* Often it can be used without a metallic shield up to 6000 volts. That's a saving. Lead sheath, too, is unnecessary. That's another saving.

Low first cost, then, usually leads to the selection of Coronol. If in doubt, however, it would be well to consult with a G-E cable specialist before deciding whether Coronol or some other insulation is the one best adapted for a particular job. Address nearest G-E sales office, or General Electric Co., Dept. 6C-201, Schenectady, N. Y.

520-113

GENERAL ELECTRIC

ELECTRICAL WEST

DEVOTED TO THE ECONOMIC PRODUCTION, TRANSMISSION AND DISTRIBUTION OF ELECTRIC POWER AND ITS APPLICATION TO INDUSTRY, COMMERCE, AGRICULTURE AND HOME IN THE PACIFIC EMPIRE, AND TO THE MARKETING OF EQUIPMENT AND APPLIANCES AND OTHER UTILIZATION DEVICES IN THAT AREA

JUNE 1937

•

WELCOME

MEN AND WOMEN of the electrical industry—here we are, June 1937. We are assembled for the fifth time. How this big, but infant industry we serve must chuckle, for to him, less than a century old, who really hasn't reached his first birthday, these five years are but a moment.

To him, conventions will follow year after year, one after another, in quick succession as he goes on growing. But to us, each is a pause. Each like this one, is an island in the cascade of everyday events, where we can pause for a second to catch our breath. Here each of us can, as it were, spread out the small collection which is our contribution to a bigger work. Here each of us can take a moment to examine our own collections, and those of the persons on our right and left, there perhaps to find a thought for which we've long been searching. Something that may plug a weakness or illuminate our picture of what lies ahead, so that we may resume our working and living with more purpose and more strength.

Here is the convention-in-print, like a page extracted from a diary of years. It tells what, on this day, this year, the electric industry is doing. Let us look at it this way—as a note in the diary of a very youthful, very human, very faithful servant, electricity, who is trying hard to do a better job.

May each of us, in reading this intimate record of his, gain a better understanding of his own problems, see more clearly the way that we can help each other serve.

This is the fifth year that ELECTRICAL WEST has been privileged to print this record for the eleven western states. For Californians it once more becomes the record of an actual convention. For those of the other regions it again simulates the convention hall. Once again it allows all of us to see ourselves, as a single unit, looking ahead.

Before you turn this page to survey the record of a bright year and the outline of a brilliant future, here in June 1937, one word from the editors of ELECTRICAL WEST to you men and women of the industry—Welcome! And now, read on!

This Is 1937-So Let's Be That Way

By GEORGE M. GADSBY
President, Northwest Electric Light and Power Association

IF a president is running his own convention, he can allot all the time he wishes to the very formal "President's Address". Then by the fact that it comes early on the program, if he does not get enumeration of the industry problems and their solution out of his system within the time provided, he can keep on going—for who can stop the president? (That is not meant as a political question!)

But a convention in print—that's a different proposition. Always impending are ye editor's ready blue pencil and trusty shears. (Again the consumer profits!) So in appearing before you on the printed page, I realize I must make my bow, offer you words of wisdom, thank the Section Chairmen, and be gone, all—quoting George Tenney—"in not to exceed one thousand words".

It's been a great year. Developments nation wide have resolved a lot of uncertainties. The people like it. The passing of an era with its methods, incentives, rules and procedures is no longer in doubt. The current may be slowed down, perhaps led into more orderly channels, but it cannot be reversed. If any man is still waiting for a reestablishment of the "good old days" he's going to be waiting a long time, and I fear will soon find waiting his only occupation.

Let's face the facts of 1937. The Government is in the power business. You may think as I do that regulated private business can give the consuming public more for its power dollar than can any form of government. This belief, no matter how eloquently proclaimed, has been unable to counteract the pressure of "free government money", huge local expenditures politically directed, and a type of oratory more eloquent than our own because unfettered by the base necessities of fact and the knowledge that today's promises must stand up under the realistic tests of tomorrow's performance.

In addition to this calculated, ably directed propaganda, we are confronted with all the spoiled and blemished fruit of selfishness which has been found on our tree, even as it exists on every tree in the industrial forest. Our only complaint is that all these poor specimens have been gathered together and offered to the public in one basket labelled as being the only, or at least the typical, product of private ownership; which in fact has been a luxuriant growth of great benefit to our people. None the less, here it is, and our job is not to waste time decrying an existing situation, but rather to face it and, so far as lies in our power, to meet it. Our goal is clear—an understanding favorable public opinion grounded in fact and not in misrepresentation and promises doubtful of accomplishment.

The methods, words and actions of yesterday are outmoded. Today's and tomorrow's public beliefs and demands must be met with ways and means modernized to be appealing and convincing to that public by whose sufferance only we exist.

Tallyrand was a political power through years of rapidly and violently changing conditions because he believed "The only force greater than Anybody is Everybody." So what? Well, everybody wants the most obtainable for their money. In the diversity, value and high quality of the contents of the electric service package, the utility company stands without a peer. Let your customers know what they get for their electric dollar.

The manufacture of equipment to generate, transmit and distribute electricity has been standardized. Competent men are available to operate the electric plants and systems regardless of ownership. But what a small part of the electric package electricity has become. The municipal plant delivers energy to the meter and calls it a day. The private company just gets going at that point. Our electricity is just an agency of service, we actually are selling *use* of electricity and not just so many units of one form of energy. I shall not here enumerate all the activities of your sales, advertising, home service, employee training, kitchen modernization, dealer cooperation, civic development and other departments, but you can well afford to emphasize them instead of just expecting the public somehow to know about and appreciate them. Do not believe that better mousetrap story. The world is too busy with its own paths to wear a new one to anyone's door. Better get out on the public's paths and interest people in their way rather than expect to invoke much interest in ours—so often too technical to have much general appeal anyway.

Let your customers know that through your teller's window they are paying for fine schools, supporting teachers, maintaining county and city governments and making a substantial contribution to the Washington outpourings. Don't complain about your taxes—it has not helped any to date—nor feature the high percentage of earnings they represent. Capitalize them. Point to the good things being accomplished by your local governmental agencies and let your people know how much of these are purchased in their electric package.

When a new school, city hall or other public building is started, get a picture or architect's drawing, and put it in your store window with a little card reading "You are in part building this fine addition to our community through your electric service bill. Last year our company paid ..... dollars for the

support of our schools—municipal government—State", of course selecting the agency responsible for the improvement.

The past year has witnessed the assumption by the government of much administrative and managerial control via the accounting route. The new systems are much more than a mere rearrangement of account numbers. The Supreme Court in the Telephone Case has approved this power on the part of Federal Commissions. Again this tide will not be turned back. My hope is that occasion—real or political—will not be found to make more drastic this accounting control.

The present year will make further changes. The mists of uncertainty will lift a little more. We may not like what is disclosed, but a rock out in the clear is much less dangerous than one in the fog. No danger is so disturbing as the one unseen. In any event the decision lies in the hands of the public and to that tribunal we should turn our face. The public in general is your customers in particular. Convince them that our industry has a net asset value to the community. The best way to do this is to spread out our wares in the market place. Open up the electric package and prove its contents a greater bargain than the bare electric energy content of the bag from the publicly owned plant.

In brief conclusion let me cordially thank our section chairmen and their complete organizations for a year of fine work. Those familiar with what has been done will heartily agree our association is worth while, bringing tangible benefits to the member companies in proportion to the work each company has contributed to the common good.

It is an honor to have been president of this organization, and I turn the office over to my successor with full assurance the incoming personnel is capable of carrying on—true to the record of the past.

So—farewell, and as I step back into the ranks—I'll be seeing you!

Ours Is a Twofold Responsibility

ELECTRICAL trade organizations in the Rocky Mountain region have for many years recognized the value, both to the individual organization, and to the industry, of unity in their plans and activities. The opportunity for such unified action in all programs having a common interest and objective was provided recently through the amalgamation of the electrical trade organizations in the area to form the newly created Rocky Mountain Electrical League.

For the first time since the inception of organized effort in this region, the electrical industry now possesses a mutually cooperative assembly for concerted action, both in the attack of problems affecting the membership, and in the acceptance of opportunities as they avail themselves.

As a clearing house for the exchange of ideas, the new league executes a service that is helpful to the individual and also directed toward the goal of group advancement and progress.

The Rocky Mountain Electrical League is keenly awake to the responsibilities which must be assumed by any organization serving the public. The league faithfully represents its membership—retailers, wholesalers, utilities, contractors, and manufacturers—in their relationships with the public, while functioning just as conscientiously in the interests of the public.

A typical example of a problem involving such a two-fold responsibility is offered by the case of load building among those customers who now use only a minimum amount of electricity. This example will serve to illustrate a function of the league, both in its service to the membership and to the public, and in its capacity as a clearing house for the collection and dissemination of facts having a general interest.

The residential customer whose home is connected with the power lines of an electric utility has at his command an almost unlimited variety of household services. Given the proper appliances, there are few routine functions of the household which he cannot execute effectively and economically with electrical energy.

By GUY W. FALLER
President, Rocky Mountain Electrical League

Yet it is well recognized that a great many customers do not take full advantage of such labor-saving services as are available. Especially is this true in the group who, for financial reasons, must limit their use of electricity. They may be unable to purchase the necessary appliances through which to enjoy this service, or they may, through necessity, be so conscious of the cost element of electric service as to carefully watch their use of this commodity with the purpose in mind of staying strictly within the minimum bill.

Load building within this group of customers is a much discussed and an important promotional problem of the electrical industry. Nor is the problem limited to the utilities only and alone, for the sales by manufacturers, wholesalers, retailers and contractors are very definitely affected.

Even more important, however, is the fact that the consumer may be denying himself services of electricity which would be of very great value to him, once these services were enjoyed and understood. Entirely too often this failure to enjoy such essential service is not due to lack of funds, but to an inherited belief that electric service is expensive and a luxury.

In other words, the customer has not kept up with the march of progress in the electrical industry. Because at some time in his childhood he was scolded for not turning out the light the instant he left the room, he has formed the subconscious belief that electric service in any form is a luxury which must not be enjoyed if such enjoyment can be foregone. Such standards of electrical service, established by parental in-

fluence in a past generation, unfortunately rob the individual today, in this era of low-cost electricity, of many pleasures and conveniences which should rightfully be his to enjoy. In homes where generosity is the motto in all other daily expenditures, every effort seems to be concentrated towards insuring the lowest possible electric bill. Who knows what irreparable damage may have been done to eyesight for the lack of the adequate but very inexpensive illumination needed? What accidents might have been avoided, with the attendant personal inconvenience and expense, if the few pennies had been spent which would have provided light in dark and potentially unsafe parts of the home?

Another typical condition in which the customer uses only a minimum amount of current is directly brought about by the architect or electrical contractor who seems to consider electrical specifications merely as an incidental, and provides only the minimum requirements in the way of lighting, wiring and convenience outlets. For lack of convenience outlets, necessitating unsightly and dangerous connections to overhead fixtures, many a homeowner has been unable to make use of sufficient reading lamps and other home appliances.

Although the electrical contractor is well aware of the value of electrical service, and has heard adequacy preached for years, all too often he is forced, through competitive bidding, rivalry and other factors, to cut the price and specifications to a point making maximum use of electrical equipment and facilities impossible.

The neighbor who talks of high bills, inferring that they are representative, or who brags of the ways in which he holds down his electric consumption, is frequently the influencing factor in creating a minimum-use customer.

Thus in its various manifestations, we have a definite and widely- existent problem which is not chargeable either to the rates of the utilities or to the prices of the appliances. Numerous intangible factors, psychological, social and economic, are bold brush-strokes in the picture. Yet the number of such minimum-use customers is large enough to create a major classification and to establish an "average domestic consumption" figure. This figure represents a class of service which costs the utility more to supply than is received in revenue, yet that very figure is singled out for reference in a manner often detrimental to the utility.

Surveys conducted among customers of utility companies have revealed the surprising fact that in one locality more than half of the minimum bill customers were found to be perfectly able, financially, to make far greater use of electric service than they were doing. Yet through the influence of such factors as those just set forth, they were denying themselves of many very desirable conveniences, while at the same time expanding that class of service which is provided at a loss by the utility.

Such a major problem as that outlined in the preceding paragraphs is typical of those being given consideration by the Rocky Mountain Electrical League.

One method of attack took the form of a radio sales campaign conducted in one section of the territory. This campaign is now in its third month, and sales have exceeded all expectations. In two months 22 per cent as many new sets were sold as were already in use. These sets were not all placed in the homes of those using the minimum or less. Many of them were purchased as additional or supplemental sets. Some represented replacements for bargain hunters who took advantage of the attractive prices.

The placing of this large number of new sets represents something far more vital than any profit which might accrue to the utility. It represents an opportunity of raising the standard of living for many who formerly either could not or did not have the entertainment and educational values offered by the radio. Th radio has lifted many of these customers out of the minimum bill category, and given them in return a value just as definite and worth while as that given by the I.E.S. lamp under like circumstances.

There is no easy solution to the minimum user problem. The number of such users may be reduced, but obviously there will always be an appreciable number of such customers on the books. Increasing their capacity to use electric service through such promotional efforts as this radio campaign does not insure that the service will be used. Curtailment of some other application of electricity in the home may be an offsetting factor.

In striving to solve the minimum user problem, many pitfalls may be encountered. There is the danger of exceeding economic reason in the effort to promote additional usage in this classification.

From appliance saturation data obtained recently by a survey in the district where the low-price radio campaign is receiving the greatest emphasis, facts regarding public acceptance and usage of existing domestic equipment have been definitely established. The following table indicates the saturation in this particular territory by appliance combinations:

Combination	% Saturation
Lights and small appliances only	17.42
Radio, lights, etc.	42.80
Radio, refrigerator and lights	23.53
Radio, range and lights	2.82
Radio, refrigerator, range and lights	9.54
Refrigerator, lights, etc.	1.46
Refrigerator, range and lights	.58
Range, lights, etc.	.10
Water heater combination	1.75
	100.00

If every radio set sold could reach a Combination No. 1 customer, about 25 cents revenue per month to the utility would be the financial reward. It is not known how much a supplementary radio set increases a customer's consumption. The low wattage of these little sets might actually reduce the consumption of an existing radio user when installed in the form of a replacement.

Among several other factors which have a direct bearing on the success of such a merchandising program, the technical structure of the rate schedule itself yields to a simple illustration. In this particular situation, for example, the average consumption of the minimum user group mentioned above amounts to 19 kw-hr. per month. The crest of the billing distribution curve falls at 15 kw.-hr., and quite an appreciable percentage of the billings are distributed below 10 kw.-hr. per month, the existing maximum consumption permitted by the rate schedule minimum.

For those consumers previously using 5 kw.-hr. or less per month, the addition of these radio sets means no increase in the electric bill whatever. For those previously using between 5 and 10 kw.-hr. per month, a portion of the radio consumption would produce no increase in the bill, while the remaining component of the radio use would cost the customer whatever unit price happened to be specified by the first block of the rate. For those already using over 10 kw.-hr. per month, the entire radio consumption would cost the unit price of the first block. Under the existing schedule, a composite of all these increases amounts to an average revenue of 25 cents per new set purchased by the group.

The above discussion has been presented as evidence that, viewed from an economic standpoint, those who undertake intensive promotional effort among those domestic customers using relatively small amounts of electricity, may meet with intricate and unexpected problems. Directed, or "band" selling is the only economical way in which this problem can be attacked, and complete knowledge as to who and where the minimum users reside in a very helpful guide toward the desired objective.

The goal to be attained is possible of achievement, and is beneficial both to the public served and to the members of the Rocky Mountain Electrical League who renders this service in its various forms.

Fulfilling Our Obligation

By F. B. LEWIS
President, Pacific Coast Electrical Association

LATE last summer the Pacific Coast Electrical Association adopted a theme to serve as a guide during the year's work. It was expressed in the two simple words "Maintaining Leadership," and was announced to the membership by means of a memorandum which set forth certain questions, such as: Does the electrical industry appeal to public imagination as it did in former years? If it has failed in this respect, then what is the reason? Or is it merely that we, within the industry, during the depression became exposed to that affliction known by the picturesque title of "the jitters?" If we are correct in our surmise that we have slipped somewhat from our former position of undisputed leadership, then what steps should be taken to regain it?

After giving nearly a year's careful study to these questions we have reached an answer consisting of two parts. The first part of the answer is something like this, "Whereas, in the earlier days of our industry, there was a fascination about everything that we did, the public now takes us and our service for granted. The same is true of the automobile, the moving picture and the radio." Dr. Little expressed it this way, "some people accept these marvels as a fish accepts the ocean."

The second part may be stated unequivocally in this fashion; "Never in the fifty odd years of its history has the electrical industry been in a better position to command public attention and respect. Its contributions to our social and economic welfare entitle it a position of unquestioned leadership."

Our convention program was designed to prove the second part of the answer—to demonstrate that our industry, through the combined talents of its research investigators, its engineers and its commercial and administrative operators is living up to its trust in every respect. This was done so that we could convince any doubter that the industry has accomplished more during the past five years than in any similar period since Edison opened the Pearl Street Station.

Our story was presented in a series of projects each dealing comprehensively with a subject of immediate interest. Each of these projects was to supply useful information so that on your return to your home you would be fortified with new facts sufficient to convince anyone that the electrical industry is maintaining its stride and that never a day passes without some contribution to the advancement of our art for the benefit of the ultimate consumer.

It might not have been immediately apparent as to just what practical value some of the devices demonstrated may have for the consuming public. Let us bear in mind that the consumer does not buy electricity—he buys illumination or heat or cold or motive power, at the time, and in the amount he wants. He has benefited if the utility has lowered its rates or the manufacturer has produced a more efficient lamp or motor or if some other manufacturer has perfected a better incidental product such as tougher glass, for example. He has also benefited if through some combination of devices his service is more reliable than formerly.

During recent years there has been a tremendous advancement in communication systems of public utilities through a better understanding of carrier current. Interruptions to service and the restoration of service after interruptions have been lessened by improvements in relays. The efficiency of hydro plants has been increased through the use of new steels and new designs for buckets for water wheels. Efficiency of steam plants has been improved through the adoption of higher steam temperatures and pressures. Continuity of service has been improved through the application of better types of lightning protection.

These and many others like them are the intangibles which are seldom appreciated by us who compose the electrical industry; while the public knows nothing at all about them. Yet they all have their place in the scheme of things—either to give the consumer better service or more economy.

Leadership depends upon more than physical factors. Successful management depends in large measure upon the understanding of the public. This brings us into the field of administration and public relations. Here again we are dealing with intangibles and again I am bold enough to say that our progress during the past five years has been notable. The turmoil which was started by the depression and agitated by hurried attempts to correct economic distress has tested the flexibility of all kinds of business. All of us—manufacturers, wholesalers, dealers and utility operators—have been confronted with new taxes, new labor problems, new methods of accounting and new legal restrictions. All of this has been annoying and yet to a degree it has been helpful. It is the tall tree that bears the brunt of the storm—the very prominence of the electrical industry has made it a target during these exciting years.

In pioneer times the general store keeper at the cross roads was intrusted with numerous errands when he made occasional visits to the larger cities to lay in supplies. As he set out on his journey he was the personal representative of each of his customers.

I like to think that we in the electrical industry serve as representatives, not of the companies who pay our wages, but rather to look after the special needs of those 6,000,000 people who are the customers of the electrical industry in the region served by this association.

If you view your particular job in that spirit you will find yourself on the alert to get ideas and bits of information which will be welcomed by your consumers.

The work of our association is dedicated to better public service to be brought about by a more thorough knowledge of our own business followed by the interpretation of that knowledge to the benefit of the consumer. Thereby we are fulfilling our obligation of leadership.

Electra's Husband

Power, Gold and Oysters

ELECTRA and I often have discussed, with infrequent seriousness, the effect of electrical problems upon politics and economics. Indeed, sometimes the discussion has gotten around to the effect of politics and economics on electrical problems.

Yet most of this, whether in "bull session" or more formal oratory, has been confined to national aspects—national laws, policies, and business trends. I wonder if we don't, by inattention, minimize the importance of *international* affairs, and their effect upon the industry.

Earlier this month, for instance, the Bank for International Settlements made its report. In at least two parts, it makes interesting and instructive reading.

With respect to gold, the report points out that banks, which a few years ago were facing a scarcity of the metal, now are facing the problem of what to do about too much of it. With pleasant and diplomatic indirectness, the report passes the buck to the United States, as the nation which can do most about the problem, since we have pegged the price, own a lion's share, and are an important producer.

Washington denies an impending lowering of the $35 peg, but a great many experts feel that the international pressure for a reduction may be hard to withstand.

Point is, mining of precious metals is a mighty fine western industry, one which uses lots of power. Many marginal mines now operating would close, should the price of gold fall. Producers of other metals, too, would find the going more difficult. Yet how many in the electrical industry, aside from the financial executives, have read into the report a threat to a big block of power—and a concomitant threat to a big block of revenue? Just consider what this would mean to purchasing power, to new construction, to maintenance expenditures, to employment in every branch.

Aren't we too often prone to read the news of international affairs without proper study and evaluation? Take even the Spanish war—most of us view it objectively, as something we don't want to get involved in, as something which has affected and will continue to affect the political history of the world, as something which allows us to pick sides emotionally, without personal danger. How many, though, have considered the already apparent effects it has had upon our own industry, our own jobs, our own futures?

Maybe we won't be so rudely surprised at developments within the industry if we take more care in the study of developments without.

●

THE encouraging note in the bank report, however, comes in these words: "Since the turning point in 1932, five years have now passed and in the history of business cycles the duration of an upward trend for a period of longer than five years has been a rare occurrence. . . . In view of this . . . is it to be expected that the present recovery will soon come to an end?

The very heartening discovery that something more to worry about is dumped into our laps, along with the other problems which already have us scratching our heads, reminds me of little Alice, who went to lunch at her aunt's house. They had oysters, Alice's first oysters. She tucked in the first with difficulty. When all the other guests had finished, Alice's aunt noticed that her little niece wasn't, and asked if she weren't going to have some more oysters. "No, thankth," Alice pleaded, "I've thill got thith one."

You don't have to think up new worries on my account, dear bankers. And anyway, it's generally accepted that our local bottom was reached in 1934, so we should have until 1939 before taking up this particular one.

●

IF I didn't know that Reno's Mr. Lemmon is very much alive, I might believe there was some connection between his excellent articles on human relations and a George Washington story I recently discovered. One morning, while he was riding over his plantation with a friend, our first president passed an humble negro, who raised his hat. And, to the friend's amazement, Washington doffed his hat in turn.

After they had ridden a short distance, the astonished guest asked Washington if he were in the habit of saluting his slaves in such a manner. Washington nodded, "I allow no man to outdo me in courtesy".

Somehow, I believe that story, because Washington was respected and trusted by most of his employees and most of the customers who elected him.

●

It's rather unfortunate that so many people go through life forgetting to put the ribbon in the typewriter.

●

Senator Wagner, in explaining his famous act, says that it will not sanction coercion from any front; it merely permits voluntary agreements between employer and employee. Voluntary, I presume, like stopping on a red light.

●

One of our junior statesmen advises us that "experience has taught that the way to avert war is to seek the pacific solution when the cloud of controversy no bigger than the palm of a man's hand first appears upon the horizon". If memory serves, P. C. E. A. President Earl Fisher warned the industry in 1932 about the rash of municipal ownership and diesel competition, using much the same terms. Since then a number of clouds have appeared on the horizon, only to get bigger and bigger. Perhaps we should have a fuller explanation of what the word "pacific" means.

●

WESTERN utilities can take heart from the present trend of industry toward decentralization. During the past several years, a great deal of effort and money has been spent by manufac-

turers to improve the efficiency of all types of equipment, so that 1937 machines are vastly superior to 1930 types. Yet, even with such technological advancement, many industries complain that costs must be reduced still further if profits are to be made while prices stay within bounds.

One of the most important cost-reducing factors being studied seriously by these business men is the movement of industry toward locales which allow for reduction in production or distribution costs by reason of better labor conditions, lower living costs, decreased freight expense for raw materials coming in or finished product going out, or any number of other possibilities.

A great deal of publicity has been given to the movement of industry into the South, to take advantage of certain of these savings. Yet industry is moving into the West on an even broader scale. Building totals in the 11 western states last year, for example, were substantially greater than building totals for the 13 southern states. And, as of March, California became the second state in the nation in new industrial building.

The reason is clear. The West is the expanding market, increasing in population more than twice as fast as the national average, with the lowest density of population and a vast acreage of unappropriated land which will be fertile and productive when reclaimed. Because of its distance and isolation, most manufacturers treat it as an export market. And, as the expanding market, it offers manufacturers the savings they are seeking.

I mentioned that utilities could take heart; truthfully, everyone in the West should be pleased at such a trend.

Bill Jones Speaks

To the Convention

MR. CHAIRMAN and gentlemen of the convention:

Much water has gone over the dam since our meeting one year ago. You have gained more confidence in yourselves and in the future of your great industry. The menace of political demogoguery is still hanging over you, but familiarity with it has lessened the fear itself.

There are many indications that the long looked for "break" is imminent; that some measure of sanity is returning to the people who at last are sensing that a loud voice doesn't necessarily denote a well-filled head. More and more is it being realized that magic and incantation will not bring the abundant life and that the nearest approach to a royal road is work—hard work. Congress is showing unmistakable indications of sensing this shift. The dynasty of political incompetence is cracking. The country and its institutions are going to be saved and remain the Old America which has done so much for its own people and for the World. We positively cannot have *more* things and at the same time produce *less* things; we can't have cheaper things at the same time get more for the things we have to sell—even our labor. The steadily rising prices of all the items which make up even the most humble family budget are giving the people an object lesson in kindergarten economics which no silver tongue can long combat.

Of course, all of this effort to lift ourselves by our boot straps, which has taken place during the past few years, must of necessity be followed by a painful reaction. No legislation and no adaptation of European failures into our American picture can repeal the fundamental economic fact that two and two eventually add up to four. This year or next year or some year soon must come the "pay-off." Years of confusion can but end with something approaching momentary chaos.

Knowing that two and two still are four, you will get your house in order. Of all industry yours will best weather the storm, but you will be wise immediately to get that domicile in shape. One of the things which may be expected of the Great Salesman when he finds his structure of cards tumbling around his ears is again to try to divert attention from that catastrophe with new, and still more weird, witches brew. The housewife demands an explanation as to why her loaf of bread has raised a cent. "Business" — big business — will probably be the demon set up in an endeavor to cover blunders that intelligence doomed to failure years ago and which experience repudiated centuries ago. So, there will be more dramatic things to contemplate unless the people themselves awaken, as there now seems to be evidence they are doing.

It has been most gratifying the past few months to note the number of cities and towns that have failed to heed the siren voice of municipal ownership. You boys have done a splendid job along this line—a great job. BUT your success should merely have given you courage and not have given you a sense of security for the future. Those battles were not won by *your* efforts. You helped; perhaps you were the deciding factor but many of these enterprises were defeated by the cumulative votes of people who have no interest or love for your company or concern for your welfare.

How much effort are you still making now that the votes have been counted? Have you stopped work on the general problem of selling yourselves and your companies to the people—your customers—and have you made intelligent effort to consolidate your gains? I am afraid many of you stopped with a temporary victory. If so, it will all have to be done over again one of these days. There must be no stopping.

It is to be sincerely hoped that before this convention closes a full and frank discussion will be held and plans formulated for aligning the utility industry with the people themselves. Good relations are not gained by lip service alone. First, there must be a general plan and a calm consideration of the problem and an honest appraisal of your own adequacy to meet it, both for the past and for the present. Other groups (other than executives) who are fond of, or at least tolerant of the company must be cultivated and stimulated to action. All of those outside of its payroll, but who are allied with the industry, must serve. Groups of citizens who have their feet on the ground and who are intelligent, fight militantly for their own best ultimate welfare.

Never in the history of the electric industry has such an opportunity been presented for constructive work—not entirely for the selfish interest of the shareholders of your companies, but for the best interest of America.

Please, Mr. Builder

By the Fellow Who is Going to Live in the Place

Say, build me a house that's right, old man,
The kind that you build to please.
A house that's wired and fully attired
For things conducive to ease.

You know what I mean by right, old man,
Chockful of electrical stuff!*
An outlet here and an outlet there,
Great guns! There can't be enough.

Put plenty in every room, old man,
Don't miss an important space;
Put three of 'em here and six over there;
Just scatter 'em every place.

I want this house for a home, old man,
An electric home clear through.
It's been my dream—my one pet scheme,
And nothing else will do.

We'll cut other costs if we must, old man,
But touch not a single light;
And chop not a chip from the outlet slip,
This house must be built just right.

*"Electrical stuff" which can be financed under the F. H. A. Credit Plan includes the following appliances and equipment, permanently attached and—or built in: Electric heating equipment, water heaters, ranges, refrigerators, lighting fixtures, signalling systems, wiring installations, dishwashers, air conditioning and ventilating fan equipment.

See Your Electrical Contractor or Dealer

The Electrical League

(A non-profit advisory organization serving the Rocky Mountain Region)

For years this League has hammered away with question-provoking ads in the "For Rent" columns and with breezy ads like this, and has made Denver citizens wiring conscious

Embarrassing Questions that W

By Suggesting Questions to the Public Through Every Means of Publicity and Advertising Available to the Industry We Can Soon Make the Public Conscious of Wiring and Have It Demand More, —This Is What the Northern California Committee on Adequate Wiring, P. C. E. A., Is Recommending to Individuals, Companies, and Associations

WHEN the public becomes conscious of wiring, it will demand more of it. The problem of selling adequate wiring, then, boils itself down to making the public conscious enough of what it is missing to begin asking for more wiring. When that time arrives, the industry will have conquered its greatest sales resistance. It will sell more wire, pipe, fittings, devices, appliances, and electric energy to operate through them. It will solve, at the same time, many of its internal difficulties. It will be more prosperous and busy. More wiring will be sold at a profit instead of a price—the lowest. Specified materials will stay specified for there will be less ambition to substitute and chisel. Quality can be sold then.

This may sound like the millennium, but it is all possible—provided the public can be made conscious of its need for adequate wiring. If it does, it will ask for more.

The public will become conscious of wiring sooner if the electrical contractors, too, become conscious of it and talk of it in the public's language.

Adequate wiring, then, seems to hinge on two major points. These should be made the basis of an all industry campaign. They are:

1. **To cause the prospective home builder, purchaser, or renter to ask for more adequate wiring facilities.**
2. **To cause the electrical contractor and any other member of the electrical industry to suggest and sell the idea of more adequacy.**

If we can build a plan around these two objectives, we may have some chance to break the "bottle-neck".

It will be noted, too, that this is a little different approach to this perennial problem than that to which we have become accustomed. In fact, the approach to wiring *should be* from the other side of the fence—the consumer's.

Every program or plan to deal with the age-old subject of wiring seems to have been approached, naturally enough, from the standpoint of our own industry. If that approach had been successful in bringing about more adequate wiring it might still be considered satisfactory. Such an introspective attitude, however, has turned itself back into the industry in the form of internal bickering and controversy. Instead of directing the energies of our industry upon the real objective—the sale of more adequate wiring—all effort has been absorbed, too often, in quarrelsome attempts of one group or another

---

1. **Are there enough places in which to attach all my lamps and appliances?**
2. **Can I put an electric clock in every room and have them so that they will be unaffected by switching of the lights on or off?**
3. **Could I plug in a radio in the living room and in each bedroom? Yes, and the kitchen too?**
4. **Could I control some of my lamps by switches so that I might light some of the floor lamps from the doorway instead of groping around to switch them on at the lamps themselves?**
5. **Can I turn on the lights as I enter a room at every door or must I grope and stumble over furniture crossing the room to find a light switch?**
6. **Is there an outlet for my washing machine where I want to wash? Or my ironer upstairs where I may want to iron? And for my mixer in the kitchen, handy to use without a lot of trouble? Can I use my percolator, toaster and other devices easily in the breakfast room?**
7. **Are there outside protective lights so that if I am at home alone I may see who is approaching? Are there lights enough around the place to discourage prowlers? Can some lights be switched on from the garage, from the rear door?**
3. **Are there electric heaters installed in the bathrooms? Is there a decent light there to shave by? Is there an outlet for the electric shaver?**
9. **If I have, or should decide to buy an electric range, is there wiring sufficient, or convenient so that I can just plug it in?**
10. **If I decide to have an electric water heater, could I get electricity for it easily?**
11. **Is there a ventilating fan in the kitchen, or could I install one? Could I use some fans or ventilators in other parts of the house?**
12. **If, in the future, we should want to install an electric range, water heater, air conditioner, or other device, are the facilities (the service equipment) such that it could be done at a minimum expense?**
13. **Are the wires of proper size so that I can operate my appliances efficiently, and so that my lamps will burn brightly. Do all the lights flicker when the refrigerator or washer starts?**

We Want the Public to Ask

to impose its ideas, or panaceas, on other groups. As a result, very little, if any, attention has been devoted to the customer himself—the purchaser. Industry plans never seemed to get as far as to reach the customers. All the force and funds which might have created more markets and more business were expended before they ever reached beyond the industry.

Th object of any program on wiring should be to sell more of it. It is to accomplish this object at the source that this new approach is suggested.

As an industry, we wish to cause the home-builder, the purchaser of a new residence, the renter of any property, to become conscious of wiring. We want him to ask certain pertinent questions. If he is conscious of what it means to him he shall ask these questions. Stated in his or her own language, the questions at the bottom of the facing page are about what she should ask and what we want her to ask.

These questions, or others of similar nature would do more to focus the attention of architects, builders, landlords —yes, and even electrical contractors and wiremen—upon the convenience which the public is coming to demand and expect, than any other program.

Indeed, the second part of a program to stimulate wiring sales, should be one to cause electrical contractors (and anyone in the industry, for that matter) who contact customers and prospects, to suggest at every opportunity the above questions.

Thus simplified, the problem resolves itself into what methods should be employed to accomplish both these desirable ends—that of *getting the public to ask* and *the contractor to suggest* the practical questions listed in the foregoing. The answer is—*every method conceivable.*

To make the public conscious, these questions should be put in front of their eyes and dinned into their ears by every conceivable means available. Newspapers ads should ask these questions. Newspaper publicity should echo them. Circulars, billstickers, letters, should tuck these questions in at every opportunity. Radio programs, spot announcements should ask them. Members of the industry in their contact with friends, acquaintances, or prospects should ask these same questions. Finally, at last, by force of repetition and constant suggestion the public would begin to ask these questions, too.

No time should be lost in starting such a program. It can be started by one individual, one company, or by any number. It can begin tomorrow morning. It should. Both by organized groups and by individual persons or firms it should be started. The sooner started, the more persistently pursued, the sooner will consciousness begin.

When that happens, speculative builders will prick up their ears. Landlords will become conscious quickly. The pressure of these questions will force its way on back to the electrical contractor—and through him to the industry in all of its branches.

It is equally important that when these questions reach the contractor they shall be grasped as opportunities and not turned back to undo all the efforts invested by the industry in having started the questions on their way. This is exceedingly vital.

Instead of the response of "You don't need it", or "What do you want all that expense for", there must be generated, even if at great pains, an attitude that accepts and follows through.

This will take a program of persistent and unremitting effort to show the wireman and contractor what these questions mean to him and to his customers. Here, instead of the wide front, expansive advertising program, the method of reaching the consciousness of every member of the industry, and the wireman and the contractor in particular, must be a man-to-man campaign of personal selling. The habits of thinking are so deeply entrenched that it will take patience, persistence, and tactful effort to readjust them.

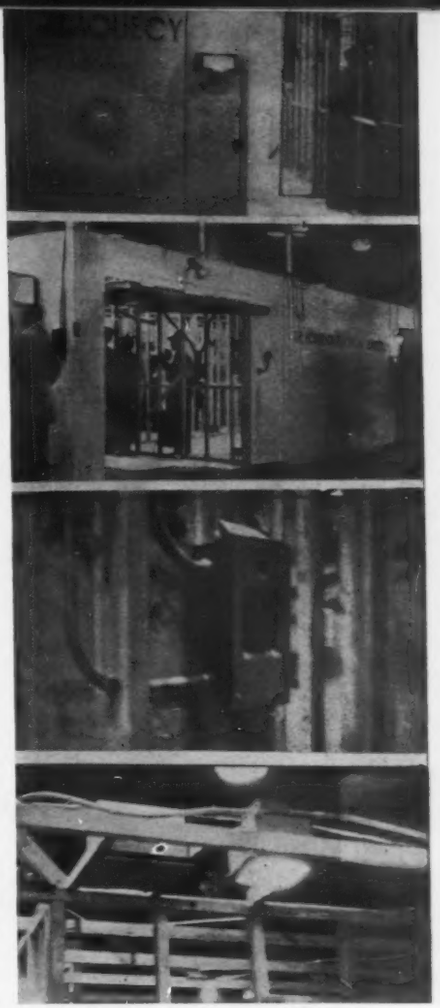
With the public, the advantages suggested by these questions are obvious. Reminding them of these benefits that they are missing, of present inconvenience and discomfort, will bring a quicker response.

But to change the thinking and habits of work in many men in a highly competitive business will take infinite patience and determined activity. Yet it is so necessary that this half of the program be carried through. By no means must it be neglected or slighted. There is opportunity here to undo too much of what has been so painstakingly built up with the public.

Another point is vital. What shall the questioner receive in answer to his question? In other words, to what may he be referred to get advice as to what should be done to provide the answer to his question? This, too, is exceedingly vital.

It would seem that the investment made by this industry during the past ten years in the Red Seal plan should be used for everything it is worth. The public, asking such questions, should be referred to the utility, the contractor, the Pacific Coast Electric Bureau, or any other organized agency of the industry for guidance. This presupposes that such agencies and individuals are prepared to give helpful advice and counsel. Likewise that they are equipped to sell the adequacy and convenience that the customer desires. At such agencies, the Red Seal plan, the Handbook of Interior Wiring Design, and other standards should be utilized to bring direction to the desire stimulated by these provocative questions.

Summarized in a sentence, the problem of wiring can be solved if the industry will use every means available to it to make the public conscious enough to *ask*, and the contractors and other members of the industry conscious enough to *suggest* at every opportunity, a series of questions about the adequacy, the comfort, and the convenience of wiring.



Electrical Contractors Assn. of Los Angeles did much to make visitors to the Electric Age Exposition conscious of wiring with a wiring adequacy exhibit—walls open, wiring exposed, and cards to tell what each outlet and fitting was for. From top down: Entrance, with illuminated house number. Automatic garage door. Fuseless distribution panel in the kitchen. Inbuilt light and vent fan over the range

Informal Investigation—A New Approach to Regulation

By E. F. McNAUGHTON
Director, Public Utilities Department, California Railroad Commission

BOTH THE utilities and the regulatory commissions are engaged in an enterprise of serving the public and, although our functions in affording this service are somewhat different, if each of us properly is to accomplish his duty, a mutual understanding of the problems and aims is certainly beneficial.

Regulation has developed through four distinct periods: first, the initial establishment of policies; second, the readjustments caused by the World War; third, the tremendous expansion in utility operations during the decade from 1920 to 1930; and fourth, the depression era which tested the mettle of both utilities and regulation. The experience gained from these four periods has demonstrated beyond question the worth of conservative management and the effectiveness of regulation in providing for the financial stability of these properties and the improvement of public service at the lowest possible rates.

Each of these four periods, however, has seen a change in the mechanics of rate regulation which is worthy of comment. During the first period following the formation of the California commission there were many formal rate complaints by municipalities and other parties. During the World War period and immediately subsequent thereto, many applications for increases in rates were filed by utilities and acted upon by the commission. In the following period—that is, from 1920 to 1930—because of improved business conditions, numerous voluntary reductions were made, in addition to formal and informal investigations by the commission. At the end of this period, and continuing through the depression, formal rate proceedings upon the commission's own motion or upon complaint were the rule.

New Plan Desirable

The passing of the depression and the experience of this quarter century of regulation in California has indicated the desirability of a plan of rate regulation by regular and continuous informal investigation. It is this program of informal investigations or studies that I wish to discuss with the hope of pointing out the benefits to be derived by the public, the utilities and the commission alike.

First let us see the advantages of this method of informal investigation. Benefits derived from conference procedure include:

1. Savings in time, as compared with lengthy and protracted formal proceedings.
2. Savings in costs of developing expensive technical and legal representation.
3. Improved public good will, as legal procedure brings out a feeling of resentment between the parties in many instances.
4. More effective regulation may be secured by this means. Not a little of the advantage to the public is the ability of the commission staff to study a number of companies informally, including attention to matters of service as well as rates, in the time one formal case would occupy.
5. Last and not the least of importance is that this plan provides a better understanding between the public, the utilities and the commission of their mutual problems.

Three Requirements Essential

Of course, by far the most desirable procedure to be followed in rate adjustments is for the utilities themselves to approach the commission concerning any rate modifications they may consider desirable. The necessary facts may then be expeditiously developed and the matter disposed of. It is desired and recommended that any public agency should proceed in similar manner. It is understood, of course, that the commission itself contemplates the inauguration of conferences in connection with informal investigations initiated by itself.

There are three essential requirements in conducting an informal review of a utility's operations:

First: There must be a desire on the part of the participants that fair treatment be accorded the three parties most at interest—the customer, the owner and the employee;

Second: All of the essential facts bearing on the problem must be available for consideration; and

Third: It must be understood that any admission or concession by any party during the course of an informal study or negotiation shall not be held against it in case agreement is not reached and formal proceeding is necessary.

How It Works

Through informal investigation and study, the commission can, within a reasonable time, accurately obtain the facts of a utility's operation. In this study the various divisions and departments of the commission cooperate and report their findings to the commission, together with their recommendations as to whether an adjustment in rates should be made.

The second phase of regulation by informal investigation then begins. Conferences are opened with representatives of the utility and the communities affected. A mutual discussion of the earning position and problems of the utility follows and if the conference is successful an agreement is reached as to the general plan of rate adjustment and the results submitted to the commission for consideration. If increases in rates are involved, it of course becomes necessary that the matter be concluded formally, so as to provide for the necessary consideration and findings by the commission, as required by the Public Utilities Act.

The third phase of the investigation, almost equal in importance to the earlier steps, is that of determining the schedules and territory in which the adjustment shall be applied. To this very important phase of rate making we may properly devote some time. In determining upon adjustments in the rates of the large number of utility systems we have today, many factors must be considered. Obviously, there is the value of the service and the ability of the customer to pay for the service rendered. Competitive conditions at times require consideration. There is also the cost of service in particular territories and for particular schedules and the question as to the form of rate to encourage wider use of utility service.

Simplification Necessary

The commission has long given consideration to system-wide operations in determining a reasonable earning level for the electric utilities and, in pursuance of this policy, the exact earnings of various portions of the utility systems have not been accorded controlling weight in fixing rates for such localities. It may be that perhaps some further weight should be given earnings in particular localities and for particular services in the formation of a judgment as to reasonable rates.

The depression and competitive situations have brought on several forms of experimental rates, which, if continued, would tend to unbalance the relationships between the various schedules of the utilities. Some of these rates, if not legally discriminatory, are certainly the cause of irritation and in some cases cause suspicion as to the intention of the utility on the part of the customer. Clearly certain domestic rates incorporating requirements for specific uses and competitive between gas and electric utilities subject to the Commission's jurisdiction, should be eliminated as rapidly as possible.

Closely akin to the competitive situation are optional rate schedules. Such schedules in many instances cause confusion to the customer. Likewise the use of special contracts raises the question of discrimination, and should be entered into only where clearly shown that the customer may not be served by a filed rate, open to all alike.

The commission's staff favors the elimination of all the inequalities created by these situations, and feels that it is in the public interest that every effort be made to reduce the number of optional schedules, special conditions and special rate contracts and, in so far as possible, to standardize and simplify the rate schedules of utilities.

The fourth and final step in an informal procedure comprises appropriate public announcement of the rates and a detailed notification to the customer, in compliance with the rules of the commission. In the public announcement lies an important step in the protection not only of the goodwill of the utility, but of the future of regulation. Reductions heralded as voluntary, when in fact they have been worked out in conference, tend to create an erroneous impression in the public mind. On the other hand, an appropriate announcement showing the participation of the parties to the proceeding improves not only the public relations of the utility, but preserves that of the commission and other public authorities who may have been participating.

Customer Notification

Another important part of the final step comprises notification to the customer of the new rates. Here the utility organization plays a very important part in the tremendous problem of notification to individual customers, often to the extent of hundreds of thousands at a time. Here is an opportunity on the part of the utility to improve its customer relations which makes the cost of such notification far more worthwhile than the protection it affords against reparations cases. The opportunity here presented is one of bringing specific rate changes to the individual customer's attention, with particular emphasis on features of the new rate which may benefit the customer.

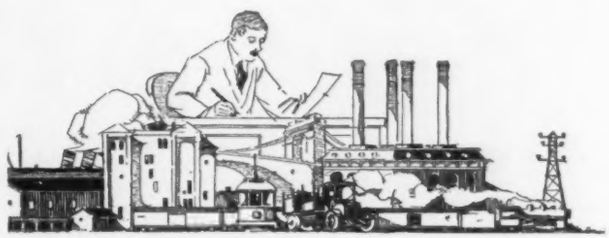
You are not only the guiding force of the state's greatest utilities—you are, as individuals, I believe almost without exception, the heads of households. Invariably, with the coming of spring, your household routine is disrupted while the establishment undergoes a thorough housecleaning. It is a fine old American custom. In a measure, through informal investigation and negotiations, the commission and the utilities accomplish a substantial job of housecleaning. Many of the inequalities in the rate schedules of these utilities, resulting, as I mentioned, from experimentation and conditions during the years of the depression, are being eliminated. All may not be accomplished at one time. In a large measure, however, progress has been made in standardizing and simplifying the schedules of those utilities with which we have conducted informal studies in the last few months. We propose that it shall be a continuing process and are confident that it will be for the best interests of the utility and of the customer.

Benefits for Everyone

That, in brief, is a summary of our aims, beliefs and intentions in sponsoring rate adjustments through informal investigation. This method has much to commend it because it permits a full and comprehensive discussion of the problems present and a prompt adjustment of inequalities, in a spirit of mutual understanding and appreciation.

However, when circumstances are such that it becomes impossible to arrive at an equitable result through informal investigation there, of course, is available the legal machinery of the formal procedure, one with which all of us are acquainted through past experience.

It is my belief that the utilities of California are now in a far stronger position in the public mind than was the case a few years ago. In most instances this is due to a realization of the value of goodwill and a policy of cooperation by the utility with the customer. It is to be hoped that the utilities will continue these policies.



As Navy dredges make the land, buildings begin to rise on the site of the Golden Gate International Exposition

Westward the Course Of Empire—

By CHARLES L. HUYCK
Westinghouse Electric & Mfg. Co.

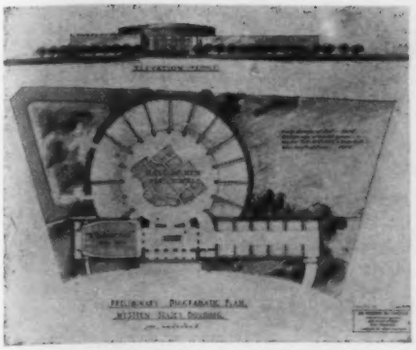
ON FEBRUARY 11, 1936, the first spoonful of the Golden Gate International Exposition site was siphoned out of San Francisco Bay. And now in June a year later, the 400-acre "Treasure Island" and its encircling three-mile fill are just about completed.

The Exposition is growing vertically as well as horizontally, for already the two permanent exhibition palaces are beginning to notch themselves into the skyline. All piles are driven; all steel work is in place; concrete has been poured, with the east structure about 50 per cent farther advanced than the west. The Administration Building, (Air Terminal to you in 1940), another permanent structure for San Francisco's future airport, is one-third completed; the ferry slips are over half done. The main block of exhibit palaces, for which a $1,100,000 contract was awarded Atkinson Construction Co., is just getting under way; the contract for the 385-ft. dominating tower is pending; and the final four palaces bordering the central court are almost ready for award.

As for that all-important fourth dimension, Time, we have journeyed along it as far as the point which occurs in every great undertaking, between the first flash of the dream and its final revelation as a fact; when all the intervening tasks lie about piecemeal and realization seems far away. But surely we of the electrical industry can pass this period in patience and optimism, because we are accustomed to visualizing our own mighty achievements from a few unimpressive blue prints.

Alongside the construction crews of 700 pipeline and dredger men, 1,000 builders of the major exhibit palaces, 1,000 workers in steel plants and rock quarries, 400 gardeners, and the 500 highwaymen (suitable on a "Treasure Island"!) who are soon to begin the six lane bridge extensions and fair avenues, there is working another skilled force, handling sales and finances, which, just now, are synonymous.

Four major drives are being waged on four major sectors. The first covers a three-million-dollar federal grant, the Congressional bill being sponsored by California Senators Johnson and McAdoo, to provide funds for adequate representation of the United States Government. The second, which the Legislature has just unanimously approved, is for a California State appropriation of five million dollars to pay for main and subordinate structures portraying historical, vacational, and other aspects of California. The third is to raise $7,500,000 by public subscription, especially important as providing immediate funds for the general rather than specific features of the Fair, and also as securing the whole-hearted support for prospective exhibitors who thus become



In the Hall of the Western States each of the Far Western commonwealths will show its natural resources and other attractions to lure both tourist and permanent resident

stakeholders. (This amount already has been two-thirds raised). The fourth effort is rather more sales than financial and aims to enlist the support of various states, particularly the eleven of the Pacific Coast and Rocky Mountain belts, and various foreign countries, especially those fronting the Pacific Ocean, which world realtors declare to be the coming eligible subdivisions for major world trade.

The legislatures of Arizona, Nevada, Oregon, and Utah have appropriated sums ranging from $15,000 to $30,000; Colorado's bill for $50,000 is pending; Idaho, Montana, New Mexico, and Wyoming are launching legislative drives to secure their participation; and a substantial allocation is assured from Washington's recent $250,000 appropriation for furthering state advertising.

"See *All* The West" is the current slogan and it will be particularly applicable in 1939, when still better roads, still faster trains, even better housing facilities, the major number of National Parks, and, of course, this Exposition as the headliner, will attract perhaps double the 1936 figures of tourist traffic. The value of this 1936 tourist business is given by the states themselves as follows and may be roughly split into one-quarter each for lodging, food, transportation, and retail purchases:

Arizona, $68,317,074; California, $275,000,000; Colorado, $77,867,244; Idaho, $30,342,250; Montana, $30,146,400; Nevada, $25,000,000; New Mexico, $59,293,750; Oregon, $35,000,000; Utah, $20,075,000; Washington, $53,024,926; Wyoming, $56,002,000.

The "Hall of the Western States" planned for the Fair is therefore one of its happiest inspirations, but instead of marking the end of the trail, it will be just a base to be touched by all these happy pilgrims on their western circuit. Additional points of interest will be Washington's and Montana's plan for celebrating their 50th anniversary of Statehood, and New Mexico's preparations for commemorating the 400th anniversary of its exploration by Coronado and his little clump of conquistadors.

To Hawaii goes the distinction of leading all exhibiting states and nations by its appropriation this February for a Hawaiian building containing a pageant of its history and activities and surrounded by tropical landscaping.

Meanwhile Arthur Halloran, chief of the Palace of Electricity and Communication, has been exceedingly busy on his own plans; to such effect that, even before his recent departure on an extended selling swing through the East, he had sold or had been able to secure gilt-edge pre-emptions on over half of the 44,807 sq.-ft. of space available in the palace dedicated to our industry.

The building conforms in general size and architectural features with its sisters of major size, being about 400x200 ft. and 60 ft. high with no galleries or mezzanine.

SEE ALL THE WEST

This slogan of the 1939 World Fair recognizes the interests of the entire West, which will hold open house to millions of prospective residents.

Facing each other across its 400-ft. length will be two beautiful and comprehensive panoramas, aided by every artifice of lighting and ingenious miniature modeling, and each covering practically the entire end of the building from floor to topmost rafter. That on the East portrays the "Drama of Harnessed Horsepower" from snowflakes in distant Sierras, powerhouses by mountain lakes or among crowded buildings, striding steel towers, intricate layouts of transformers and switches, down to the meters and the daily electrical miracles in our homes, offices, and factories. The west wall dramatizes "Communication," across what was once the wildest and loneliest of oceans, with fiery tracings of the voice highways and all the new Pacific routes of the past decade.

Between these two beautiful models and running the entire length of the building, there will be a pictorial relief map of the eleven Western states, with

Buildings which are now but webs of steelwork will first house exhibits and later serve as aeroplane hangars

special reference to present and potential power centers and to existing and prospective industries based upon natural resources. By skillfully applied fluorescent lighting this map will not only show present achievements, but will also portray the almost incredible, yet conservatively estimated, developments of the near future, so that side by side, or rather in two simultaneous strata, one can visualize what lies ahead.

Commerce is converting our planet into one department store, and electricity is annihilating geography. Manufacturing plants of the present, and still more of the future, will grow alongside the raw materials which call them into existence; and this prophetic map will cry to Westerners that our era of empire is here. With one-quarter of the nation's entire generating capacity, with cheap fuel and transportation, with almost every known industrial mineral, and hitherto unsuspected stores of hitherto unconsidered raw material; with a 1,500-mile frontage upon the Ocean of Destiny and a 1,500-mile slope toward that frontage—well, Westerners are sitting pretty. This Golden Gate International Exposition will make us vividly aware of what we have heretofore only suspected.

Across one end of the Palace of Electricity will be a huge panorama depicting the "Drama of Harnessed Horsepower"

Field Experience With Low Cost Residential Underground

This Symposium of Operating Practice Among Western Utilities Consolidates Widespread Opinions On the Various Phases of This Current Problem. Unanimity Clear On Maintenance of Service Standards Above All Else But Experience With New Equipment Promises Reliable Operation From Buried Systems

EDITED BY A. W. FLIPPIN and C. R. MACHEN
Both of the Underground Department, Pacific Gas & Electric Co., Oakland, Calif.

Low cost residential underground systems have received much discussion, and no little experimentation, during the past ten years. With the return of home building and the rapid growth of residential load, it was believed that the time was now ripe to consolidate the industries viewpoints on the subject and to determine trends in field practice concerning it. If the hearty response to the questionnaire is a criterion, there is a definite need for additional experience and a continuation of study and research in this matter.

Space requirements prevent setting forth in full all of the answers received to all 21 questions. Hence, each of the questions is presented as general discussion in which are included the different views and ideas received. As will be seen, divergent opinions are prevalent and controversial viewpoints frequent. However, it is hoped that the exchange of ideas and information as represented by this symposium will be helpful and stimulating.

Question No. 1: **Is your company actively interested in developing low cost residential underground systems?**

It appears that the utilities operating in cities of 150,000 population or more are actively interested, probably due to the greater activity of real estate subdividers and their demand for a low cost underground system. In the larger cities where there are numerous subdivisions and the sale of the lots is more competitive, the absence of overhead structures has a strong sales appeal. The older and more established residential districts in larger cities often bring strong pressure for underground construction when the existing poles require replacing. There also are many cases where certain streets through residential districts eventually become main thoroughfares and civic pride requires the removal of the overhead. The larger city, having more demands for low cost underground, must give the problem of developing such a system more active thought than the smaller city with less demand for this type of construction.

Question No. 2: **To what extent do you feel justified in experimenting with such a system?**

The majority of the companies feel that some experimentation is necessary and justifiable. They are of the opinion that new ideas and methods of construction should be carefully scrutinized to be sure of their practicability and permanence. The use of the newer types of cable for direct burial in the ground, the use of buried transformers, the elimination of splicing boxes, etc., are attractive from a reduced cost standpoint but apparently most engineers desire more operating experience in the use of this type of equipment before large scale installation is attempted.

One company felt they were not justified in spending money in experimenting with underground systems since it did not wish to publicize underground installations in general, the cost being considerably in excess of the usual overhead methods of distribution.

Question No. 3: **Can you give us some idea of the amount of residential underground you have installed in the last five years?**

It would probably have been wiser to have asked for the amount of system installed in the last ten years instead of the last five years. Generally speaking over the whole Pacific area there has been a very limited amount of residential underground installed in the last five years. The advent of the depression seems to have almost completely curbed the activity manifested in low cost underground eight or ten years ago. It appears that instead of using the depression as the stimulus for low cost system installation and development, the black outlook for the future caused all activity to cease with low cost underground as well as with other lines of activity.

Now that the depression appears to be a matter of history it is hoped the various companies once more will become active in initiating low cost residential systems. One company has approximately forty miles of underground in residential areas, of which approximately ten miles have been installed in the last five years. Another company which had installed no residential underground in the last five years, installed in 1926 a fibre duct, lead-cable system in an exclusive, new residential district planned for an ultimate of 350 residences. It is interesting to note that, to date, 115 residences are connected to the system with an average annual consumption for each residence of 6,900 kw.-hr., which is an extremely high average.

Another company, which had no installations within the last five years, installed three residential underground systems in the period from 1928 to 1930. The largest is a complete duct system. The other two are quite small buried cable installations with transformer manholes. This company has in addition a more extensive system that was not originally built by the company, but to which they have made a number of extensions.

Still another company installed 3,500 ft. of system in the last five years. Another had on June 30, 1930, 182.4 duct miles and 174 miles of primary and secondary cables and on June 30, 1935, 187.7 duct miles and 222 miles of primary and secondary cables, an increase of 6.3 duct miles and 48 miles of cables in the last five years. However, this system is not strictly a low cost system although it is constructed along different lines than the usual residential

underground. The conduit systems are constructed by and at the expense of the tract subdivider under plans and inspection of the company. The cable system is installed by and at the expense of the company with partial advanced payments by the consumers with refunds due to load growth.

One company has recently installed over three miles of low cost system necessitated by the city making the street an arterial and requiring the removal of the pole line.

Question No. 4: **Do you believe your company would be warranted in making a special engineering study for the purpose of planning and installing experimental systems?**

It was almost the unanimous opinion that the utilities would not be justified at this time in making such special studies. In only one case was it believed, without reservation, that such a study would be warranted. Several engineers feel that such studies are worth while providing they are for the purpose of designing definite systems to be installed and not merely to gather engineering information. There seems to be no question that the companies feel the necessity of being on the alert for new methods and innovations arising from such installations by others. If a company waits until the immediate need is present for the construction of a low cost residential system, it will find it difficult to profit by the experience of others on information and ideas gathered at the last minute. The alert distribution engineer will be constantly gathering information as it is made available and be developing new ideas of his own as a background for use when the occasion arises. Only by such constant attention as this can definite and continuous progress be made.

Question No. 5: **To what extent would you approve the installation of radical ideas in order to obtain operating experience for future construction of such systems?**

Perhaps it would have been better if the word radical had not been used in this question, or at least a definition of the word given to indicate how much territory the word was meant to cover. One company went so far as to refuse to approve any radical ideas that would tend to cheapen the cost of underground construction, maintaining that if the customer desires the underground system and is willing to pay the increased cost necessary to provide it, standards should not be lowered.

However, most companies were of the opinion that if the reduction in cost is enough to justify the installation they would have no objection in trying such ideas, providing the installation had promise of being reasonably long lived and satisfactory from a service standpoint. Some companies are desirous of trying out the newer ideas, but have been unable to obtain the necessary appropriations from the management. With the approach of better times it is probable that money can be more easily obtained to try out some of the ideas proposed by the various operating engineers.

Question No. 6: **Do you believe it is wise to reduce the standards of service to obtain increased savings on the cost of the systems?**

All of the companies are unanimous and definite in their opinion with regards this question. The answer is *NO*. Quoting from the opinions of some of the companies:

"No, we are not inclined to reduce the standards of service as our belief is that the future may demand more of the utility than has been the custom in the past."

"No. Our underground systems serve the highest class of residential loads, where cooking and waterheating by electricity are almost universal and we do not feel that we can reduce the standards of service below that maintained on our overhead networks."

"We feel that the standards should not be reduced in order to obtain the advantages of this system. As a matter of fact, it is our thought that with the increased use of electricity by the residential user, the demand for continuity of service becomes more imperative and therefore construction standards in no way should be lowered."

"We do not consider it wise to reduce the standard of service now rendered by saving on the first cost of the underground system, and are of the opinion that it would not be possible to reduce the cost of underground service to compare favorably with overhead without sacrificing reliability."

There seems to be no question about the fact that the feeling is that the utility cannot afford to tamper with or experiment with quality of service now rendered (unless it is on the conservative side). The trite, but true saying "we cannot have our cake and eat it too" is brought to mind. If the cost of residential underground is to be reduced to a basis comparable with overhead it will be necessary to give up something along the line. Maybe we do not wish to develop a comparable system, but if we could, there would be the great advantage of putting the management of our companies in the position of pleasing and cooperating with more of the residential public at no increased cost to the utility.

There seems to be no basis for determining what is the minimum service that could be satisfactorily rendered. Undoubtedly what one of the companies is classifying as a high standard of service is in reality rather poor compared with the service some other company is giving. It would be interesting and valuable to determine from an unbiased study of the different grades of service rendered just what is *Minimum Service*.

Question No. 7: **If so, please rate the following in the order you think they should be sacrificed for lower system cost:**

voltage regulation
continuous service
facilities for supplying service in case of failure to primary or secondary cable
facilities for uninterrupted service during system maintenance and operation

This question seems to be a rather superfluous one, because in no case would any of the answering companies do without any of these four features and gave them all an equal rating. For the sake of argument and at the risk of being severely criticized we present our own answer to this question.

We believe that the standard of service a consumer demands is determined by the type of service he is accustomed to receiving. His first gauge

---

These data were compiled by circularizing the major operating companies of the West with a questionnaire of 21 questions prepared by Messrs. Flippin and Machen who edited the responses into this very interesting round-table discussion. Participating in it are the following well-known engineers: M. M. Koch, Public Service Co. of Colorado; Glenn Smith, Seattle City Light Dept.; F. L. Rohrbach, Washington Water Power Co.; C. R. Higson, Utah Power and Light; P. C. Gill, British Columbia Electric Railway Co., Ltd.; Wallace Quistdorff, Puget Sound Power and Light Co.; J. F. Hodges, Southern California Edison Co. Ltd.; C. H. Jenkins, Los Angeles Bureau of Power & Light; E. Y. Porter, Nevada-California Electric Corp.

On behalf of the industry, Electrical West takes this opportunity to thank those that participated in making this symposium possible.

THE EDITORS.

Redwood curb hole pull box installed with the top 9 in. below ground level. Primary, secondary and street lighting circuits are carried into the box in conduit with service buried directly in ground

for determining whether he is satisfied with his service is the voltage regulation he receives. If his lights fluctuate every time the refrigerator turns on, or they flicker every time a neighbor turns on an electric appliance, he will not be satisfied with his service. Voltage regulation undoubtedly comes before continuity of service. Service as now rendered is remarkably free from periodic interruptions. In those cases where there is an outage, there does not seem to be pronounced unfavorable reaction if the consumers are told there is a burn-out and given reasonable assurance that service will be restored as soon as humanly possible. No permanent criticism seems to result from such cases, especially when these interruptions are far apart and he has no complaint with the voltage and service as otherwise rendered.

It is felt that provisions for supplying service in case of failure to primary and secondary cable is of much more importance than provisions for supplying uninterrupted service during system maintenance and operation. The periodic maintenance required on a properly constructed system is small. In those cases where it is required no trouble should be encountered in getting early morning or "off-hour" shutdowns to do the required work. Consumers have invariably been found fair in these matters when properly contacted. There seems to be no reason why appreciable savings cannot be made in the installation of residential underground by keeping standby facilities for serving in cases of burn-outs at a minimum and facilities for uninterrupted system operation very limited and eliminated in most cases. First quality equipment should be purchased, properly installed, and then be expected to operate satisfactorily without too much extra expenditure for duplicate facilities. Just how far to go in these matters could be determined from past operating experience after a satisfactory minimum has been decided on.

Question No. 8: **In installing such a system which do you prefer for location of equipment. Please give reason; street, sidewalk, or rear property?**

There appears to be considerable difference of opinion in regard to this question. The companies are quite evenly divided on the choice of location. Undoubtedly the manner in which the city or town is laid out determines the choice of location. In those cities where rear property space is available, this location is preferred, while, if it is not available, the sidewalk area proved to be the next choice. Those companies preferring the street did so because they thought that the equipment would be more accessible. However, paving costs would probably be high and traffic conditions might make it difficult to work on the equipment. Moreover, the problem of interference with the equipment by the sewer or water workman, particularly if buried cable were to be used, might be more serious in the street.

Where the sidewalk area was indicated, the decision was made because of lower paving costs, less interference with and by traffic, and less difficulty in combining street lighting circuits and distributing circuits in one system. Furthermore, the sidewalk area appears to offer better possibilities for the installation of buried cables, etc., in the opinion of those companies preferring this location.

Rear property is preferred by some and apparently they have had some success in the installation of equipment in this location. This area may prove of value in those cities where alleys are available, particularly if the other utilities are located in the street. However, there are numerous cities where alleys are not available and, in these cases, it might prove difficult to obtain permission from the property owners to install equipment in such areas. Also, maintenance might prove more costly because of the necessity of using exceptional care in the removal and replacement of shrubs, etc. It appears that local conditions would for the most part govern the area most desirable for the installation of the system.

Question No. 9: **2,300-volt, single phase feeder taps have many advantages over higher voltages for this type of system. Will you please comment on your opinion about this, especially where the feeder voltages exceed 2,300 volts.**

A 4,000-volt, 4-wire, star system seems to be the universal favorite. One company, however, is using a 4,800-volt delta system, three primary cables, 4,800-volt single phase transformers fused on the primary side, and single conductor secondary cables, all cables lead covered. Following are some of the answers which give a cross section of the system used:

"Our experience of voltages higher than 2,300 or 4,000 has been very limited and, therefore, cannot express a very good opinion in connection with the higher voltages. There may be reasons for giving higher voltages consideration, but, as a rule, underground is required in rather high class residential locations and voltage regulation has been necessary. The recent improvement in tap changing transformers would undoubtedly have some bearing on the cost of regulation, and thus make the higher voltages much more adaptable than they have been previously."

"In general, the distribution system should be 3-phase, 4-wire, 2,300/4,000 wye. This would simplify the primary cable construction and make it readily possible to use the non-metallic armored cable."

There seems to be no question about the advantages of the 2,300/4,000 volt system—due mostly to its present extensive use. In the event a higher voltage is being used in the particular area to be served a very careful study would be required to determine whether a stepdown bank should be used or the higher voltage used in the underground system. It would appear at first thought that the most satisfactory arrangement would be to use the higher voltage and save the necessity for the extra transformation. The increased cost of the higher voltage cable and distribution transformers probably would not offset the cost and complication of the extra step down transformers. A factor to consider in the use of the higher voltage is the increased hazard. With a system constructed along minimum lines, the clearances and isolation of the primary might require the use of a more expensive cable armor or duct system, to prevent a

primary fault communicating to the secondary cables.

Question No. 10: **Please give your comments on the following primary cable systems:**

a. Minimum size of conductor.

b. Paper, rubber or synthetic rubber insulation.

c. Steel tape or wire, lead or non-metallic armor.

d. Install cable in conduit or bury directly in ground.

e. If buried directly in the ground to what depth and what type of cable do you recommend? Do you favor placing a board or concrete slab over the cable?

f. Have you any new or "pet" ideas which you believe would lead to a less expensive primary layout?

(a) The choice here was about equally divided between No. 4 and No. 6 cable. One company which has never installed primary cable smaller than No. 4, felt that where the load was limited, No. 6 or even No. 8 cable could be used with perfect satisfaction providing this size cable was large enough to carry the load. Where load requirements do not govern, mechanical strength might be the deciding factor since, if the cable is too small, it might be possible to pull it in two during installation in a conduit.

(b) The use of paper insulation predominates, with rubber the next choice. However, a number of the companies expressed a preference for synthetic rubber. In connection with the use of the synthetic rubbers for insulation, it is the understanding of the authors that these compounds are poor dielectrics and probably would prove unsatisfactory for use as cable insulation. Even if they could be made with good insulation qualities, it is probable that the cost would, at the present time at least, be out of line with other suitable materials. This was a misleading question since what was meant was the newer rubber insulating materials compounded by the use of organic accelerators and anti-oxidents.

(c) The use of lead-covered cable predominates on existing low cost installations, with one company using a jute covering over the lead. With the exception of one company which expressed a preference for rubber insulation with a steel tape, the general opinion favored the use of non-metallic armor. While it was not so stated in the replies, it is probable that the non-metallic armor would include the newer rubber jacketed as well as the more common forms of non-metallic coverings. The use of paper insulated non-leaded cable is questionable because of the damage that would result in the event of a break in the armor. Furthermore, rubber insulated cable can be bent with a shorter radius in a small curb hole or splice box without damage to the insulation. Increased activity in underground construction probably will see the increased use of the non-metallic armored cable.

(d) All companies, with the exception of one, were agreed that the cable should be buried directly in the ground without the use of conduit. The one exception believed that lead cable installed in conduit should be used. It is apparent that the buried type of cable has a definite place in the picture and will be accepted by most companies concerned with underground construction. However, in the use of the buried cable, practically all companies agreed that conduit should be used where the cable had to be installed under a highway or street, probably because of the vibration to which the cable is subjected in such locations. If this were not done paving costs might increase maintenance expense unduly in the event the cable had to be replaced.

(e) Opinions as to the depth at which the cable should be buried varied from a minimum of 18 in. to a maximum of 36 in. with the majority of companies preferring a depth of 24 in. to 30 in. The depth of burial of cable is probably a function of local conditions, traffic, type of covering used, and possibility of the cable being dug up by gardeners, etc. The use of metallic and non-metallic, armored, rubber-insulated cable was favored for the most part with the non-metallic armor predominating. Those preferring the metallic armor did so because of the greater safety resulting from the use of the grounded metal sheath.

The use of a covering of some kind is favored, with materals such as wood planks, tile, concrete slab and creosoted boards being suggested. In those cases where tile had been used it had proven more costly and concrete or wood were being considered. It is our experience that the wooden plank is not particularly satisfactory since it will eventually rot and to most laborers be just another obstruction to be dug out or cut through. Creosoted boards probably would be satisfactory from a life standpoint but would be of doubtful protection otherwise. It would probably be more desirable to use the money that would be spent for a covering to dig the ditch deep enough to bury the cable about 36 in. For primary cable, most companies favored metallic armoring with a covering of some kind, concrete and tile apparently being favored over wood, although there were some that believed that if the cable were buried deep enough satisfactory safety would be obtained.

(f) One answer obtained to this question is as follows: "If there is any one pet idea, I think it is in the use of non-leaded cables for both primary and secondary and particularly the metallic shielded primary cable. Although manufacturers do not advocate the shielded type of cable below about 15,000 volts, I am convinced that any insulated cable with voltage as low as 2,300 to ground is decidedly more dependable if enveloped in a metallic ground sheath. To my mind the ideal layout for a residential underground would consist of a 4,000-volt (2,300 to ground), Y-connected, grounded-neutral, 3-phase system; single phase, one-wire, primary, branch feeder cables with any of several kinds of insulation, shielded by the grounded neutral in the form of a layer of fine wires surrounding the insulated live conductor and having about 2/3 of the live conductor cross section. This grounded neutral sheath to be protected by a braid. Primaries to be laid in duct in the street, sidewalk or parkway space. Secondaries to be laid in duct along the rear lot lines,

Concrete curb hole used in a recent buried cable installation made in Oakland, Calif. Both square and round pre-cast units are being tried

Appearance of transformer vault and service box used by the Nevada-California Electric Corp. in its low cost underground system at Palm Springs, Calif. An interior view is shown on page 63

at right angles to the primary street leads, direct from transformers at the middle of each block.

"I don't believe it would be desirable to put the primaries and secondaries in the same duct even with the type of cables described above, but I do feel that the power companies and telephone interests ought to be able to use the same service boxes and possibly even the same ducts for secondary and telephone cables and service. There would be a greater economy if joint use of ducts or at least parallel ducts laid in the same trenches were used. Such economy could easily equal the cost of ducts as compared with cables laid directly in the ground and still provide a flexible system for both electric and communication service."

One company has a system constructed as follows: Lead-covered, primary cable in creosoted wood conduit laid in the ground. There is no secondary system, each consumer being served by an individual transformer in a vault on his own property. Buried junction boxes provide sectionalizing points to be used during repairs or additions to the system. The distance between consumers makes a secondary system impracticable.

Question No. 11: **There are numerous methods of installing transformers for this type of load. Please give your comments from the viewpoint of getting a minimum cost installation yet embodying permanent and operable construction on the following:**

Minimum size transformer manhole in street or sidewalk

transformers in special case for direct burial in the ground.

Use of large sewer tile or other small housing for installing transformers by shrubs in park strip or on property lines.

Placing transformers on poles on property lines or side streets.

There does not seem to be much preference whether the manhole is placed in the street or in the sidewalk. It was pointed out in some cases that sidewalk area had the advantage of usually cheaper paving or surfacing, the preferable location for the cables was in this area, and a lighter construction could be used due to much lighter surface loads. The recommended average size is 6x6x6-ft. for a maximum capacity of 50 kva. None of the companies have had any experience with the direct burial of transformers in the ground excepting as outlined in the April, 1936, issue of ELECTRICAL WEST. There seems to be no good reason why marked economies would not result from an extended use of buried transformers without interfering with the maintenance and operation of the system. The possibilities of buried transformers have barely been touched. Their further use will disclose many improvements in design and installation. The practice of placing the transformers in a small housing on the ground surface seems to meet with general approval. One company builds a 4x4 ft. concrete slab on the top of the ground on rear property lines, with a No. 12 gauge corrugated galvanized culvert 42 in. in diameter, 48 in. high, with a 3/16 in. plate welded on the top, for housing transformers. The section of culvert can be installed at a low cost comparable to a large concrete sewer tile. Some companies have experienced such difficulty with rear property construction, due to the difficulty of access after the tract has become built up.

There is quite a difference of opinion about placing transformers on poles on side streets or property lines. Some companies feel that if an installation is to be underground, then the transformers should be underground and they would consider no other method. Other companies believe this is a very desirable method of transformer installation due to its cheapness as compared with manhole construction. In those cases where the secondary runs will not be too long and the system design will permit, transformers installed on poles off the tract proper, should be very economical and also provide a very flexible layout.

In residential underground the installation of the transformer, its housing, fusing, and disconnecting means represents an appreciable portion of the total cost and should very readily lend itself to lower cost by the use of unit construction such as can be employed with a buried transformer.

Question No. 12: **What do you think of placing the primary fuse in the same case and oil as the transformer in order to save the cost of the fuse housing and its installation?**

From the answers received, it is not very difficult to draw the conclusion that this idea is unpopular. In only two cases was a favorable reply given. One company said "OK" and another said "It is always a problem of placing the necessary fuses for the transformer in order to save space and to insure protection. We are very much in accord with placing the primary fuses in the same case with the transformer core." However, some of the other companies feel that it "Does not seem practical, either from an operation or maintenance point of view." Also "I favor the use of a separate compartment mounted on the side of the transformer case similar to the disconnecting switches on large network transformers, rather than a cutout mounted in the same case. I think the mechanical difficulties encountered in mounting a cutout inside the transformer case would more than offset the saving."

One company said they would possibly consider the elimination of a primary fuse entirely and use a transformer with the circuit breaker in the secondary and mounted on the inside of the case of the transformer in a manner which is now being followed by certain manufacturing companies. A primary transformer fuse mounted inside the transformer case should be a very simple matter if the proper fuse is used, such as the expulsion fuse now available with a cooling chamber on the blowout end and designed for operation either in an oil bath or air. The fuse housing and oil are already available in the transformer and by the addition of two fuse clips in the tank fuse protection should be very easily accomplished. Should the fuse blow due to a secondary fault, the small amount of metallic vapor blown into the transformer oil should not prove

injurious to the oil even after numerous operations.

Question No. 13: **Would you favor not installing an individual transformer fuse but instead fusing the primary tap at the riser pole where it connects to the main lead, regardless of the fact that there is more than one transformer on the same fuse?**

Opinion is quite evenly divided on the pro and cons of this question. Some like to fuse their transformers for overload protection, in which case more than one transformer on a fuse would not meet their requirement. With other companies the fuses are for short circuit protection only, in which case multiple fusing is objectionable only from an operating and maintenance standpoint. Others feel that present day distribution transformers have such an excellent operating record, that certain liberties can be taken and several transformers placed on a single fuse. The answer seems to be someplace between that required for rendering "super" service or satisfactory service. It seems that in those cases where the system design will permit one fuse on the primary tap line for several transformers a saving can be had which will not seriously affect the operation of the system.

One company had this to say, "We would use no transformer fuse nor fuse at any other point on the feeder. In case of a primary fault, the main circuit breaker at the substation would be relied upon to clear the trouble."

Question No. 14: **What is your opinion on the following methods of installing a low cost secondary cable system?**

Use of a conduit

Placing primary and secondary cable in the same duct.

Burying cable directly in ground. Depth and kind of cable recommended?

Most companies seem to be of the same general opinion that the conduit in the secondary cable system could very readily be eliminated. One company felt that they would not give up the flexibility of the conduit system regardless of the saving that might be had. The practice of installing primary and secondary cables in the same duct was very much in disfavor. It was believed that the lack of flexibility coupled with the chance of a primary or secondary fault communicating one to the other would make this construction undesirable. Such a system has very few advantages over one in which the cables are buried directly in the ground.

Although there is some opinion to the contrary, most companies favor a non-metallic armored secondary cable buried 24 to 30 in. in the ground with a 2 in. creosoted plank placed for protection.

One company recently installed approximately three miles of low cost secondary system consisting of two 1/0 all-rubber cables with a No. 2 neutral. The cable was installed in the park strip along each side of the street with precast concrete curb holes used for service connections. The services were of the same style cable with No. 6 copper size. The cable was buried at a maximum of three feet in the park strip and two feet on the consumers property. The secondaries terminated on a riser pole on the side street at the end of each block where the transformers were installed.

Question No. 15: **Do you agree that multiple street lights with control devices as developed today offer marked economies and advantages over the conventional series system?**

Most companies believe the multiple system in underground areas offers substantial savings. It is difficult to see where the extra circuit required for the series system is warranted when the secondary mains buried along the park strip are already available. The use of this existing capacity for the street lighting load should permit the quotation of a lower rate and thereby encourage additional use. The splendid operating record of the extensive multiple system of the city of Seattle proves the economy of this type of lighting and foretells its extended use in the future.

Question No. 16: **Regarding multiple street light control, do you favor the use of a centrally-controlled pilot wire or the newly developed individual electric time switch with an astronomical dial?**

A centrally-controlled relay or time switch system is almost unanimously preferred to the individual time switches. Two companies favor carrier current control. The individual time switch has the two disadvantages of requiring resetting of the clock mechanism in the event of a power failure and the difficulty of synchronizing the switches so the lights will all turn on and off at the same time. To offset these, however, there is the extreme flexibility offered by the individual switch, together with the savings that can be made by the elimination of an extended pilot and control system. Generally speaking, the individually-controlled system should be more dependable and the savings derived from it as compared to the series system could be put into the secondary distribution system to improve the quality of service, since the distribution would then have a two-fold use, residential and street lighting load.

One company has two fairly large subdivisions with approximately 150 multiple street lights. Both systems have individual relays in each electrolier with a pilot wire controlled from one central relay. These systems have been in operation for over seven years and the operation has been very successful, proving to this company the merits of the multiple system.

As the individual time switch is used more extensively for overhead street lighting and major electrolier systems, its potential savings in residential underground systems will undoubtedly become more apparent.

Question No. 17: **Based on the excellent operating record of present day underground cable and transformers, how far do you believe it advisable to go in eliminating sectionalizing points, fusing, standby facilities, etc., in order to render first class service at a reduced cost?**

Interior view of a transformer vault and service tap. The dry climate permits use of brick vaults and trenchlay or parkway cable. In rocky soil cable is laid without duct, tile being used where soil conditions permit. Note grilled drain covering gravel drainage bed and bare neutral

The answers to this question varied widely. Where buried cable is used, one company favors a loop system with the necessary sectionalizing points for proper operation. Another company would not countenance the elimination of any sectionalizing points if the result would reduce their standards of service. Others felt that while sectionalizing points would prove convenient in operating, much could be done toward their reduction with a consequent reduction in costs.

All companies were apparently in agreement that no particular stand-by facilities would be required in a well-designed, low cost system.

Question No. 18: **Since it will take considerable time to get operating data on the later types of construction such as buried cable, transformers, etc., how far do you think we should go in eliminating sectionalizing points, etc., in order to reduce costs when at this time it is now known to what extent they will be required to permit rendering good service?**

This was evidently poorly stated since most of the companies felt that the answers under question (17) applied to this question also. However, one company stated, "The only way to find out is to give it a thorough trial" —indicating that in their opinion, considerable experimentation would be necessary before the answer could be obtained.

Question No. 19: **Do you think the saving made by the use of buried primary and secondary cables with non-metallic armor for mains and services will be offset at a later date due to outsiders digging into the conductor and receiving shocks? The general consensus of opinion among the present safety bodies and municipal authorities is undoubtedly in favor of a metallic armor either on the cable or by means of a pipe.**

This question seems to have two answers, yes and no. Some feel that, since experience has proven that it is about as easy to dig into a cable with metallic armor as without, the non-metallic cable with a plank covering is safe construction. Those who do not favor buried cable construction under any condition feel there is a hazard present in any cable installed without conduit. Most of the advocates of buried cable agree that the primary cable should have a metallic shield to ground any tool driven into the cable. This can be either in the armor proper or the neutral can be spiralled around the cable and provide the ground protection.

Experience seems to show that persons digging into cables very seldom incur injury. When they dig through four inches of concrete and cut into primary cables, it is difficult to see how any reasonable method can be employed to keep them away from cables either in conduit or directly buried in the ground. One thought would be the advisability of placing either surface pillars or flush markers designating all primary cables and acting as a warning of its presence.

Question No. 20: **In residential underground layouts, do you favor larger secondaries with fewer transformers or smaller secondaries with more transformers?**

Three of the companies answered this question specifically citing their present practice. One used 2/0 secondary cable fed from 50 kw. transformers spaced a maximum distance of 550 feet. The second company uses a secondary of 2/0 cable with transformers spaced 600 feet. The third company used 4/0 cable with transformers spaced every 600 feet.

Interior of service box used at Palm Springs constructed of brick with plaster surface. A pre-cast concrete cover is used. Fibre caps cover ends of secondary service splice

Those who did not answer the question specifically point out that the relation between cable size and transformers was a question of economics with voltage regulation, size of loads, distance between services, and type of territory served being the controlling factors. As pointed out previously, one company eliminated all secondaries by installing a transformer for each customer, the services being too far apart to make the use of secondaries economical. In this connection it would appear that the use of the buried transformer should offer marked economies due to the elimination of transformer manholes or vaults. This should be especially true when the demand for this type of transformer requires its manufacture in large enough quantities to permit a material reduction over the present prices. In the case of the cable, an engineering study might indicate a different size necessary for each separate system or area, whereas, for warehousing reasons, it would be more desirable to stock one or two sizes only.

It appears that good practice would be for a company to determine the most economically sized cable to stock and then standardize on this particular size for all underground areas, increased load requirements being taken care of by additional transformers. The buried transformers could well be used where applicable.

Question No. 21: **Do you believe it possible to reduce the cost of residential underground to where it will be as cheap to replace deteriorated overhead with underground, considering the lesser maintenance and upkeep required by the well-constructed underground plant?**

It is the universal decision that a low cost residential system cannot be designed with materials and methods now available which will approach the cost of an overhead system. Although this goal may not be reached at this time, it is the ideal toward which to progress in designs and experiments with low cost underground. It does not require much engineering effort and imagination to construct residential underground systems along mildly radical lines. Other phases of present electrical construction were just as inconceivable twenty years ago as an equivalent cost underground system is today. Undoubtedly there is going to be an ever increasing demand for underground distribution in new real estate developments and the next 30 years will see at least 40 per cent of the present higher class residential districts with underground service. If this future increased use of underground can be foreseen and designs made to meet it with a system of comparable or even lower overall cost than the present overhead upon which our rate structure is now based, a real engineering service will have been performed to both the consumer and industry.

In conclusion, the authors of this symposium wish to thank those who took the time and answered the questionnaire. If the exchange of information can be the means of stimulating interest it will have served its purpose.

The Operators' Viewpoints On Demand Meter Practice

This Symposium On Demand Meter Practice Was Compiled at the Request of a Large Western Utility Which Suggested That a Summation of Operating Procedure and Experience With Types, Testing and, Troubles Would Be Valuable

Edited by KYLE M. STEVENS
Bureau of Shop and Tests
Southern California Edison Co. Ltd.

IN recent years the tendency has been to incorporate a demand clause in lighting and power rate schedules. Such schedules usually require the use of demand meters. Originally only consumers purchasing energy at wholesale rates could qualify for such a meter, but the rate schedules have been repeatedly liberalized until now many lighting accounts are on a demand basis. The earlier demand meters were largely of the recording type and used a spring wound clock as the timing device. The smaller accounts do not justify the expense of a recording demand meter installation, so the indicating type demand meter, usually with a 15-min. interval, is now extensively used.

The operation of the modern watthour meter has been perfected to such a degree that it is very dependable for long periods of time without any inspection or maintenance. In contrast to this, demand meters usually require very frequent inspections and even then, are often not satisfactory. The maintenance expense of demand meters is quite a problem to the electric utility. It is desirable to adopt a maintenance program that will be adequate and yet will not be economically prohibitive. The cost of maintenance varies with the different types of demand meters. This cost includes the time and mileage necessary to replace the register, and the shop charges to repair and test the faulty register. The problems involved in adjusting the billing or in estimating the demand, in addition to the effect on consumer relations, cannot be evaluated, although they probably are more costly to the utility than the actual repair expense.

The manufacturers are continually striving to improve demand meters. Usually, when an improvement is made and a new feature or model is available, special covers or adapters are necessary in order to put into use the improved product on metering equipment already in service. This requires a greater number of spare parts to be carried in stock. The attitude of the manufacturer is quite a deciding factor in determining the types of meters to be purchased. Some manufacturers are very liberal in their adjustments in exchanging types that have given unsatisfactory operation. The question of delivery has also become a problem. On an emergency order, one manufacturer may make four weeks delivery, while others are from eight to thirteen weeks.

In an effort to coordinate the experience and practice of the various utilities, a questionnaire on "Demand Meter Practice" was sent to the electrical utilties of the western states. There were thirteen companies that responded. One of these had practically no demand meters in service so that the summary is based on twelve sets of answers. The following is a list of the questions and a summary of the answers.

Question No. 1. **Do you have a demand clause in your rate schedules?**

All reported "Yes".

Question No. 2. **Is it for lighting accounts, power accounts, or both?**

9—reported both lighting and power accounts.

2—reported power accounts only.

1—reported wholesale power only.

Question No. 3. **What are the requirements to qualify for such a rate?**

The rate structures are so complicated that no tabulation of answers can easily be given. Generally, the requirement for lighting was based on a minimum monthly charge. One company reporting requires only 15 kw. in lighting in installed capacity, while the average was about 25 kw. The average requirement for power accounts is that the consumer must have a connected load of 50 hp. One company requires 100 hp. to qualify for an indicating demand meter and 500 hp. to qualify for a recording demand meter.

Question No. 4. **Do you use indicating or recording demand meters or both?**

84 per cent use both types
8 per cent use indicating only
8 per cent use recording only

Question No. 5. **What types are used and approximately how many of each type are on your system?**

Three-fourths of the companies reported the number of each type in service, the other companies only gave the types, but failed to give the number of each in use. The total number reported was 5,350 meters and 66 per cent of this number are used by two of the companies. The following is a summary of the percentage of each type in service.

	Per Cent
Integrated Graphic Type	
General Electric Printometer	.8
General Electric Recording DG1, DG2	.4
Westinghouse Recording RA, RB	16.4
Integrated Indicating Type	
General Electric 1M10, 1M14, 1M20	19.4
Westinghouse OA, OB, RW	22.4
Duncan T-1, T-2	3.7
Sangamo HM, HB	6.4
Lagged Demand	
Thermal (the only make mentioned was Lincoln)	30.5

Note: In answering another question a company that had failed to report the number of each type in service, mentioned that it has 650 Lincoln type WD meters. These are not included in the above figures.

Question No. 6. **Do you have a routine inspection program for demand meters? Give details.**

Type of Demand	*Number of Companies Reporting*	*Inspection Period*
Printometer	1	Weekly
	1	Semi-weekly
Graphic Recording	3	Weekly
	3	Monthly
	2	Annually
	4	(did not report)
Indicating	2	Monthly at time of meter reading
	3	Annually
	3	No inspections
	4	(did not report)
Thermal	5	No inspections
	1	Annually
	6	(no thermal demands used)

Question No. 7. **Do you have a routine maintenance program for demand meters?**

6—report having a maintenance program

2—not a general program

2—not at present

2—(did not report)

Question No. 8. **What is this program and does it differ with the various makes?**

There were relatively few answers to this question. All seem to agree that the clocks on the recording demand meters should be serviced annually.

One company reports annual servicing of all types of modern makes. All others are retired when they fail or when they are removed from service.

Question No. 9. **Is your maintenance program entirely satisfactory?**

Although a few are satisfied with their present maintenance, the majority are not.

Question No. 10. **In your maintenance program do you service the demand attachments in the field or in the shop?**

Four companies do all servicing in the shop.

Five companies do all servicing in the field.

Two companies make minor repairs in the field, but major repairs or thorough cleaning is done in the shop.

One company did not report.

Generally, the tendency is to repair and service clocks for recording demand meters and printometers in the shop. The repairs and routine servicing of all other types are made in the field where parts or facilities are available.

Question No. 11. **What are the details of your servicing procedure?**

Dismantling of clocks and registers and thorough cleaning and oiling, in addition to replacing any worn parts.

Question No. 12. **What is your routine test period for demand meters and at that time what maintenance or servicing is done to the demand attachment?**

Four companies make routine tests annually.

One company makes routine tests on graphic demand meters every 3 months and on indicating demand meters from 6 to 24 months, depending on the importance of the account.

One company has a two year routine test period.

Two reported no routine test period.

Four did not report.

One company reports no servicing of the demand attachment during the routine test, all servicing is done in the field by the demand inspector.

During the routine test the predominating practice is to inspect for friction that might interfere with correct registration, check timing and reset devices and the position of the zero setting.

Question No. 13. **How many faulty indications or failures of the various makes do you have in a year as a per cent of total demand meters in service?**

Recording Demand Meters — The maximum failures reported was 15 per cent and the minimum 0.4 per cent. It was interesting to note that the two companies reporting these extremes have the same program of routine tests and maintenance, but the one reporting the minimum failures makes annual inspections, while the one reporting the maximum failures has twice as many meters and makes monthly inspections. This indicates that there must be an error in some of the records.

Indicating Demand Meters—The failures or faulty indications varied from 1 per cent to 26 per cent, the average reported was about 10 per cent.

Thermal Demand Meters—The maximum reported was 2 per cent and one company has had no failures.

Question No. 14. **What part of the demand attachment gives you the most trouble and what per cent is this of your total faulty indications or failures?**

Recording—clock .....50 per cent
reroll and chart feed.....30 per cent
ink and pen trouble.....20 per cent

Indicating—About one-half of the companies reported the majority of their trouble was due to the timing device, while the others report that all of their failures are caused by faulty clutch.

Thermal—Only one company reported any troubles and this was due to movement of the indicating hand by jarring.

Question No. 15. **Compared with older types, do you now have as many faulty indications or failures?**

All agreed that there is an improvement in the operation of modern types.

Question No. 16. **Are you satisfied with the present development of demand attachments?**

Two companies report that present demand attachments readily meet their requirements. One of these has 40 per cent printometer demands and 25 per cent thermal demands. All other companies reported that they are not satisfied and several were very emphatic on this point.

Question No. 17. **Do you have a preference of make and why this preference?**

One company stated they were limited to Westinghouse because their rates specify a 5-min. interval for recording demand meters.

Three companies prefer the G. E. 1M20 demand register because they have the least trouble with this make. It has a more rugged construction and a superior synchronous timing motor.

Three companies prefer the thermal type demand meter where the recording type is not required. Two of these definitely name the Lincoln demand meter as the best available meter.

One company stated they have 650 Lincoln type WD meters in service and thus far have not had a customer complaint by reason of faulty indication. Another company states that it prefers the thermal type because indicating demand attachments are too complicated and compact. The thermal type is very simple, with few moving parts. It was admitted that the biggest handicap of this type meter is the greater space requirements, particularly when added to old meter installations. The third company prefers the Lincoln thermal demand meter because of its continued accuracy. It needs no lubrication. After five years of use it maintains the same accuracy as when installed. Their only objection to this type demand meter was the additional space required.

One company prefers the Duncan Type T-2 demand device because of its simplicity, and believes this type register will be satisfactory except for the timing motor.

Another company states it has discontinued the use of demand attachments. One stated that it has no preference and two failed to specify any preference at all.

There are several conclusions that may be drawn from the answers to this questionnaire:

1. The electric utilities are not satisfied with the present development of demand registers as a whole.

2. There is a wide divergence of opinion as to the necessary frequency of inspections, the details of an adequate maintenance program, and whether demand attachments should be serviced in the field or in the shop.

3. There seems to be very little connection between the frequency of inspections or the maintenance program, with the number of demand failures.

4. There is a larger percentage of thermal demand meters in the service of the companies reporting than any other type.

5. Where the Lincoln Thermal demand meter is used, it gives satisfactory

service, with practically no maintenance.

Although the Lincoln demand meter gives satisfactory service, its use is limited in many companies because the lagged demand follows approximately a logarithmic curve, while the rates are based on a block interval demand. Also, the added cost of the extra piece of equipment in addition to the watthour meter is approximately 20 per cent higher than a watthour meter with a demand register. The tendency is to minimize the space provided for the metering equipment and an additional meter is often prohibitive. Routine tests on this type of meter are not usually made in the field due to the time involved.

It is hoped that this questionnaire will stimulate the practice of exchanging ideas and experiences among the different companies in order that demand metering will be more satisfactory.

Hydraulic Repair Practice

Herein Are Described Field Practices Employed by Operating Engineers in the West. The Paper Is a Report of the Operating-Economics Section of the Pacific Coast Electrical Assn.

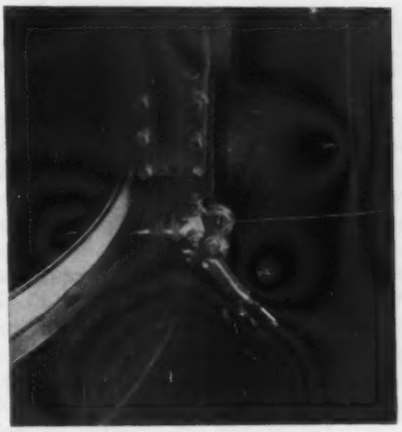
By T. C. STAVERT
Hydro Generation Department
Southern California Edison Co. Ltd.

EVERY plant operator constantly strives to improve the overall efficiency of his plant and to keep maintenance and replacement costs to a minimum. Numerous practices develop from operating experience which permit economies to be effected and it is the purpose of this paper to describe certain of these which have been employed to an advantage.

Corona Damage to Windings

On August 21, 1935, the armature of a 17,500 kva. generator at one of the Southern California Edison's hydraulic plants failed, the resulting fire necessitating the removal and re-insulation of 60 armature coils. This generator, a General Electric 3-phase machine, is rated at 10 kv., 500 r.p.m. at 50 cycles and 11 kv., 600 r.p.m. at 60 cycles. It operates with an ungrounded neutral. The armature winding consists of 126 coils, Y-connected in three circuits of 14 coils each per phase, with composite insulation. Careful inspection of the coils after removal showed 27 of them nearest the line end of the winding had been damaged by corona which worked its way through part of the varnished cambric insulation on the outside of the coils along the edges of the surfaces which were in contact with the sides of the slots. The location of the damaged coils in the armature circuits was such that the voltage to ground varied from approximately 4500 minimum to 6350 maximum at 60 cycles.

In view of the evidence of corona on the machine that failed, an investigation of the second identical generator at this plant was made and a similar condition of insulation deterioration due to corona discharge was found. As these machines are each connected to Y-delta transformer, with the high side solidly grounded, it was considered that the penetration of impulse voltages would not carry very far into the generator winding. Such being the case the neutral ends of these windings, even though operated with neutrals ungrounded, should be relatively free from incipient weaknesses due to incoming surges and corona discharge. This being true, the winding of the second generator was transposed at the terminals and re-connected so that the neutral ends now operate as the line ends and vice-versa. This change places the coils, which formerly were subjected to the highest voltage to ground, near the neutral where the voltage stress will be relatively low. It is confidently expected by this change to materially lengthen the service life of this winding.



Seal ring for a Francis-type turbine being built up by metal spray. The ring is turned in a boring mill, the spray gun being mounted on the frame

Metal Spray

The adaption of metal spray to the solution of the maintenance problems on hydraulic generation equipment is being thoroughly investigated. The use of "build-up" welding by the electric arc method to renew worn surfaces of water wheel buckets, turbine seal rings and other wearing parts, has been used to a considerable extent, but, due to heat stresses, this form of maintenance presents problems of distortion, cracking and to a certain extent change in parent metal characteristics are quite frequently experienced. These disadvantages should not be present in metal spraying.

The first practical application of metal spray used by this Company was made in 1932. Due to corrosion and rust, the friction at the bearing surfaces of the needle bodies of two 10,750-hp. impulse units had become so great as to make it exceedingly difficult to operate the needle nozzle valves. Each needle stem or body was removed and set up in a lathe. The two bearing sections, 12-in. in diameter by 28¾ in. long and 8½-in. diameter by 21½-in. long, were cut down 1/16-in. and, in order to afford a good bonding surface for the metal spray, a sharp 30 to 1 in. thread was cut, after which a sand blast was directed against the threaded sections to thoroughly clean them and beat over the edges of the threads. To prevent oxidization of the parts, spraying followed immediately. Stainless steel wire was used for a total build up of 3/32-in., after which the parts were ground to size. The metal was applied in very thin layers, twenty hours spraying time with one gun being necessary to complete one needle body. The segregation of costs for this job were as follows:

Gas—Oxygen and acetylene	$29.44
45½ lb. stainless steel wire	32.96
Labor	36.79
Total cost—1 needle body	$99.19
Area sprayed	1,657 sq. in.

To date the operation of these needle nozzle valves has been very satisfactory.

The first build up of turbine seals was made in 1934. In this case the rotating seals of a Pelton, single-runner, Francis-type, horizontal, reaction turbine rated at 4,000 hp. operating at a head of 236 ft., were built up approximately 3/32-in. with high carbon steel by the metal spray method. To date this turbine has been in service approximately 10,000 hours since spraying. Although the rings have not been removed for examination, well maintained clearances, which have been checked at regular intervals, indicate that the service life of the sprayed surface is very satisfactory. At the same time this job was done the turbine shaft and thrust bearing tail shaft were built up at the packing glands, which points had worn considerably. The turbine shaft is 16½-in. in diameter

and was built up with 7/32 in. of high carbon steel for a length of 8 in. and the tail shaft, which is 4½ in. in diameter was built up 7/32 in. for 6 in. of its length, after which the sprayed portions were ground to size. This also has proven to be a very satisfactory repair.

Our latest use of the metal spray was to build up a worn stationary seal ring for a Pelton, single-runner vertical, Francis, reaction-type turbine, rated at 25,000 hp. and operating under a static head of 800 ft. On this job a total of .437 in. on the diameter, of sprayed metal, was deposited on the wearing surface of a bronze stationary ring 60 in. in diameter with a face width of 3½ in.

In preparation for spraying, the ring was set up in a boring mill, the surface to be sprayed was turned to a true circle and a 16 to 1 in. thread 1/16 in. deep was cut, to improve the bond to the sprayed metal. Spraying followed immediately using two, Model No. 81 Metalspray guns mounted with the spray nozzles 5 inches from the ring and separated 180 deg. on the circle. A .062-in. yellow brass coating was first sprayed, due to the lower cost of the brass as compared to the stainless steel desired for the wearing surface, and to the fact that it sprayed more rapidly than the steel. Oxygen was supplied to the gun at 17 lb., acetylene at 15 lb. and compressed air at 60 lb. No. 12 B & S brass wire was used. After 2 hours and 5 minutes operation of the two guns the desired thickness of brass was obtained. With a minimum of delay the spraying of the stainless steel was started over the brass and in 3 hr. and 20 min. the two guns had deposited 0.156 in. of stainless steel, bringing the ring to the desired diameter allowing 1/32 in. to grind the sprayed metal to a true smooth surface.

The maximum ring temperature reached during the spraying operation was approximately 220 deg. F. At this point a jet of compressed air was directed on the ring, midway between the two spray nozzles, after which the temperature did not exceed 150 deg. A contraction of .017 in. on the diameter between the ring temperature immediately after spraying and with the ring cold, was measured. Although at this writing the ring has not been reinstalled in the turbine, the appearance of the completed spray job gives every indication of a very satisfactory repair.

In October, 1932, an experiment was conducted in the spraying of stainless steel on the inside of the bowl of a water wheel bucket of a 10,750 hp. double overhung impulse unit operating under a head of 877 ft. Considerable difficulty was experienced in obtaining a bond between the sprayed and parent metal and although a job that appeared to be fairly uniform was finally obtained, subsequent irregular wear and some peeling after the bucket had been in service for some time indicated that the proper bonding method was not used. About 80 per cent of the metal, however, bonded properly and after approximately 20,000 hours service the sprayed surface is still in very good condition. Further experiments will be conducted, using various bonding methods and it is confidently expected that metal spray will be found to be the answer to the problem of impulse wheel bucket maintenance.

The ease of application of the sprayed metal, the wide field of metals from which to make a selection and the absence of heat distortion of the parent metal during application, results in a more satisfactory repair job than any other method. The potential possibilities of the adaption of metal spray to the various problems that are confronted from time to time are unlimited and give promise of similiar satisfactory results over a wide field of uses.

●

Turbine Supervisory Instruments Check Operating Conditions

Development of accurate and dependable telemetered recording instruments for the protection and supervision of large turbines, by remote control, was described by J. L. Roberts and C. D. Greentree, both of the General Electric Company, in a paper presented to the Annual Meeting of the American Society of Mechanical Engineers, held in New York. These instruments measure and record on telechron-driven charts the shaft eccentricity, bearing vibration, shell expansion, and detect interference or rubbing of rotating parts.

Four new meters which check turbine operation, providing a permanent record of eccentricity, vibration, expansion and interference

The recording instruments show the presence of these unusual conditions and will enable the operator to make changes required in his operating procedure, thus avoiding, to a great extent, probability of injury to the turbine.

The complete eccentricity recorder consists of the recording instrument and the control unit mounted on a panel shaft ring, the detector coil, mounting yoke, switch, and motor-generator set, the latter to supply 500-cycle power.

The detector coil is mounted on a yoke attached to the turbine foundation, and presented to a ring on the turbine shaft. The eccentricity or wobble of the shaft induces variation in the 500-cycle current, which is fed into the control unit, whose output operates a photoelectric recorder. The recorder measures shaft eccentricity in thousandths of an inch from turning-gear speed to synchronous speed. The range of measurement is from one one-thousandth of an inch to one one-hundredth of an inch at full scale deflection. Two ranges of sensitivity are provided; one for operating at turning-gear speed, and the other speeds.

The vibration amplitude recorder includes the recording instrument, amplifier, time switch, detector units, and a panel-mounted push-button station. A vibration detector unit is mounted on each of the turbine bearings on which the vibration is to be measured. Through the amplifier the detector output is connected to and operates the recorder. Vibrations as small as one-fourth of a mil may be measured at any frequency from 10 to 60 cycles per second for 1,800 or 3,600 r.p.m.

The complete expansion recorder consists of a recording instrument, panel mounted, and the displacement unit. The relative axial motion between the turbine shell and the foundation operates a displacement unit placed where it is desired to measure the expansion. The remote recorder indicates expansion from cold condition on a linear scale graduated in tenths of an inch.

Included in the complete interference detector are a high-gain amplifier, panel mounted, together with a loud speaker and one or more detector units. The device has a relatively flat frequency response characteristic extending into the upper range of audibility, whereby faithful reproduction of the turbine noises can be obtained. The detector units may be placed where required on the turbine, and may be connected as desired to the loud speaker which gives a more accurate indication than is possible to obtain with the usual listening rod.

Rural Electrification—Can We Make It Pay?

By A. C. McMICKEN *
General Sales Manager, Portland General Electric Co.

RURAL electrification and particularly farm electrification sponsored by R.E.A. has focused attention upon a problem which has confronted operating utilities for a great many years. The obligation of rural electrification is recognized, but many of the fundamental problems have not had the study and consideration they deserve. To extend electric service to the farmers of America on a wholesale basis in the shortest possible time without due regard to such fundamentals as the territory to be served, the ability of the various classes of farmers to understand and make profitable use of electricity in agriculture, or to pay for electric service and the necessary wiring and current consuming equipment, may seriously injure the program.

The answer to the question "Can We Make It Pay?" depends very largely upon factors which vary greatly between states and, in many instances, within the confines of the same states, and present problems which each utility must solve for its own territory. Without discounting the alertness and aggressiveness of the utilities of California, which state has the highest farm electric saturation, the necessity for many months of irrigation pumping from wells in its fertile valleys has largely made rural electrification possible and profitable in that state. Rural electrification has also reached a high state of development in the fertile valleys of western Oregon and Washington without the benefit of irrigation loads comparable to California, and in face of higher construction and maintenance costs in timbered areas, because of diversified farming, and the possibility of securing an average of from four to six and occasionally more farms per mile of line. In the dry farming areas of central and eastern Washington and Oregon where only wheat is grown on very large ranches, offering one customer to every two or three miles of line and only ordinary farm home and barn uses of electricity, large areas are unserved and will remain unserved for many years to come. Similar areas in southern Idaho are now well served because federal and state irrigation projects have supplied the necessary water to these areas, resulting in diversified farming, better than average farm incomes and, therefore, the ability on the part of the farmers to profitably use and pay for the needed electric service.

The above examples have been cited to indicate that no one can undertake to answer the question "Can We Make It Pay?" without knowing the conditions to be met.

Considering the problem in its broader aspects, by and large, the answer is "yes." To what extent rural electrification is made to pay depends first upon the definition of the word "pay," and second upon the policies and aggressiveness of the serving utility.

If by making it "pay" we mean producing net earnings, the answer must be qualified; if, on the other hand, making it "pay" has the financial obligation of producing a sufficient revenue to prevent any "out of pocket loss" little or no qualification is necessary; while if we go further and concede that a slight deficit may be more than offset by the good will engendered and the development possibilities in electrified rural territory, we get an unqualified "yes."

The second qualification of the extent to which rural electrification can be made to pay—"the rural electrification policies and the aggressiveness of the utility"—is not so much a matter of "can" as "will." If the utility is willing to lay down a rural electrification development policy of reasonable liberality coupled with a policy of real customer service, which is not so shortsighted as to stifle customer friendliness; if, in addition, it will pursue an aggressive rural development program with a staff of college-trained agriculture engineers and farm service men who understand the utility's problems and policies and who are able to talk the farmers' language, the limits are only those of the requirements of the farms to be served and the economic status of the farming community.

This year marks the twenty-third anniversary of my company's advent into the field of rural electrification as such. When confronted with the problem in

Flooding this summer pasture was impractical. Solution to the problem of irrigating the Zadino clover and alfalfa was the installation of two, low pressure (5 to 10 lb.) sprinkler systems

* Abstract from a paper before the E. E. I. Sales Committee Meeting, Chicago.

1914, we had no precedent to follow. We now have in operation some 2,800 miles of rural distribution lines serving approximately 30,500 suburban and farm customers, of which 12,485 are farms. The average density of strictly farm customers per mile of line is steadily decreasing as our lines are gradually extended into less populous areas, and at present we have an average of slightly less than five farm customers per mile of line.

The original rural line extension built in 1914 was a little more than a mile and a quarter in length and served seventeen customers. Today we would welcome the opportunity of building many miles of line with this load density and would do it without any urging on the part of the prospective customers and without any obligation on their part other than signing the customary service agreement.

Between 1914 and 1923, before the Public Service Commission of Oregon established line extension rules for all utilities in the state, we tried out and discarded several extension policies ranging from requiring the customer to advance all of the cost and use it up in service within two or three years, to a plan in effect today under which we finance and build on a 4 or 4¼ to 1 investment ratio on the basis of guaranteed monthly minimum revenues for five year periods, after which the tariff minimums apply automatically.

Initially our rural rates were considerably higher than urban rates, but since 1925 rural rates have been made uniform with urban rates for similar service, making it a little more difficult to make rural lines self-sustaniing, but creating satisfied customers and proving valuable in discouraging political agitation for the formation of farm cooperatives and People's Utility Power Districts in rural areas. At present our general farm service rate is our regular domestic rate with a $3 monthly minimum, for which the customer may use lighting, cooking and heating appliances, and single phase motors to the carrying capacity of a 5-kw. stepdown transformer. If 5 kw. of transformer capacity is not desired, minimum charges as low as $1.00 per month apply, unless higher minimums are necessary to guarantee the investment ratio during the first five years.

This farm service rate for ordinary farm light and power requirements has done away with the complaints and misunderstandings arising from the former practice of having the farm home on the residence rate, farm power on a power rate, and possibly also the poultry buildings or dairy buildings on a commercial lighting rate if deemed commercial in nature.

At left, a 60-gal. electro-steam boiler, rated 4,500 watts, medium size, grade A. Qualifying for an off-peak, 8-mill rate, it costs $8 to $10 per month to operate daily. At right are laying hens, handled by the confinement battery method, which doubles capacity of the laying house

With the exception of utility motors and occasionally brooders and soil heating equipment, our farm service men do not sell equipment but refer equipment sales to established dealers. As an example of some of the activities of six of our rural service men during 1936, I list the following:

Made 6,195 calls resulting in the addition of equipment with an estimated annual consumption of 1,011,000 kw.-hr., with an annual revenue conservatively estimated at $20,000. Some of the load building equipment added is as follows:

- 38 small irrigation systems mainly for summer pasture and truck gardens; from 2 to 20 hp.
- 459 domestic water systems.
- 128 utility motor loads.
- 47 electric poultry incubators.
- 288 electric brooders.
- 30 dairy water heaters.
- 4 electric steam dairy boilers.
- 30 soil heating cable installations.
- 159 poultry house lighting installations.

In addition the Rural Service Department worked up 258 rural line extensions of varying lengths which, together with the addition of farm customers residing along existing lines but not connected, added during the year 1,287 new customers with estimated revenue from them of $32,663. Other development activities of the Farm or Rural Service Department, the results of which cannot be immediately translated into increased kilowatt sales, included cooperation with the county agents in farmer educational meetings, cooperation with the staff of the Experiment Station at Oregon State Agricultural College, and with the members of its Extension Service, cooperation with the 4-H clubs' farm electric program, and also with the Smith-Hughes program; assisting dealers in agricultural equipment for use on the farm, in promoting sales of the proper sizes and types of equipment, and last but not least, the adjustment of complaints from farm customers, all of which the rural service representatives are best able to do because of their ability to comprehend the farmer's viewpoint and talk his language.

I do not believe that rural electrification can be successfully carried out on a wholesale basis and be made to pay for a long period of time after the customers are served. Farmers are less familiar with electric service and its applications than other types of customers, and are slower to adopt new methods. For this reason the gradual but steady extension of lines into rural areas year by year, followed by constant educational work by trained farm service men in cooperation with all other agencies such as Agricultural College Extension Staff, county agents, etc., will, over a period of years, make rural electric service pay.

After twenty-three years of rural development, we now face the serious problem of further extending to the foothills farms on the east and west sides of the Willamette Valley where the density of customers is three or less per mile of line, where the farms are only partially cleared and developed, and where the incomes enjoyed are often too small to at present make such line extensions economically possible.

Mr. Ray's office too has become a laboratory. The walls are blue grey, the ceiling and venetian blinds also. Desk and furniture all have been painted a neutral matt surfaced blue-grey. With parchment cylinders concealing and diffusing light from mercury capillary and Cooper Hewitt lamps and incandescent lamps of high wattage, Mr. Ray gets 350 to 600 ft. candles on his desk and says he can work intensively with his eyes for hours at a time without strain or sense of fatigue. He knows because he has tried it repeatedly. That is why he feels school rooms need equally high levels of illumination. The painting on the desk is to watch the effect on color under different levels and kinds of light from different sources

In Quest of Light and Intelligence

When Sausalito's Superintendent of Schools Became "Darkness Conscious" he Began the Search for Complete and Satisfactory Answers to a Number of Important Questions about Light and Seeing, and the Industry is Cooperating to help Him Find Answers

By A. W. RAY
Superintendent of Schools, Sausalito, California

SAUSALITO'S investigation of school lighting began as a personal problem. But very soon it was understood that this personal problem, like most other so-called "personal" problems, was really not personal—it was social. Thousands and millions of other men and women, boys and girls, are facing the same problem—the problem of eyestrain, with all its serious consequences of nervousness, ill health, pain, discouragement, and unhappiness. But it was necessary for me—as a person—to experience these consequences before I could give sympathetic attention to the misfortune of others.

I was confronted with the very real problem of failing eyesight, discontinued graduate study at university, and probable abandonment of a profession in which I had spent more than twenty years.

Expenditure of several hundred dollars in the offices of optometrists and ophthalmologists had brought no results. Accumulated lenses might indicate some desire to collect those instruments of vision as evidence of research into the science of optics. . . . Disappointment and discouragement had almost degenerated into despair.

While sitting in the office one day, I was interrupted by the school nurse who had walked in to ask some routine question.

"How's the eyes?"

"I think I'm going blind," said I.

"Good!" said she. "I wish all school superintendents would go blind!"

"Why?"

"Then maybe you would listen to the school nurses who are trying to get something done about the eyes of the poor kids."

"Why don't you nurses do something about it?"

"Too late! We didn't build these dark schools with all their crazy desks and their blackboards and their dirty walls. And we didn't print all these books with type so small that no person, child or adult, should be reading it."

That was only the beginning. For half an hour she went on. Finally, she said, "Wait a minute. I'll get the record cards."

The Personal Problem Becomes Impersonal

What she showed me during the next few minutes began to have meaning. In the light of my own experiences of the preceding months, there slowly shaped itself a picture of great masses of children, thousands of them, perhaps millions of them, who never quite see the world in which they live. They are not blind, only partially blind. Some of them, many of them, will become blind—later; but they are not blind yet.

Ideas went chasing through my memory: The purpose of the school is to develop intelligent men and women . . . We are not born with intelligence . . . We acquire it from the experience of living . . . In other words, we "learn" intelligence . . . Most of what we learn comes through the eyes . . . If we can't see, how can we learn? . . . Why waste money trying to educate boys and girls who can't see? . . . Why can't they see? . . . What can we do about it? . . . Can anything be done?

"Well, suppose you school nurses were given the authority to do something about this problem. What would you do?"

"It would take more than 'authority'. It would take a mountain of money. First it would take quite a sum to purchase glasses for the children who are born with certain eye defects. Then it would be necessary to feed the ones who don't get proper food."

"They don't see with their stomachs!"

"No? Did you ever try to read when you were hungry?"

Then she went on to explain that even normal eyes cannot see in the dark. What is seen, is seen only partially. It is not fully understood. It is not remembered. And the reader discontinues the unpleasant and fatiguing effort as soon as possible.

If the sun cannot find its way into dark corners hidden by low ceilings and tiny-windowed walls, then some artificial light must be provided.

But how? What kind? How much?

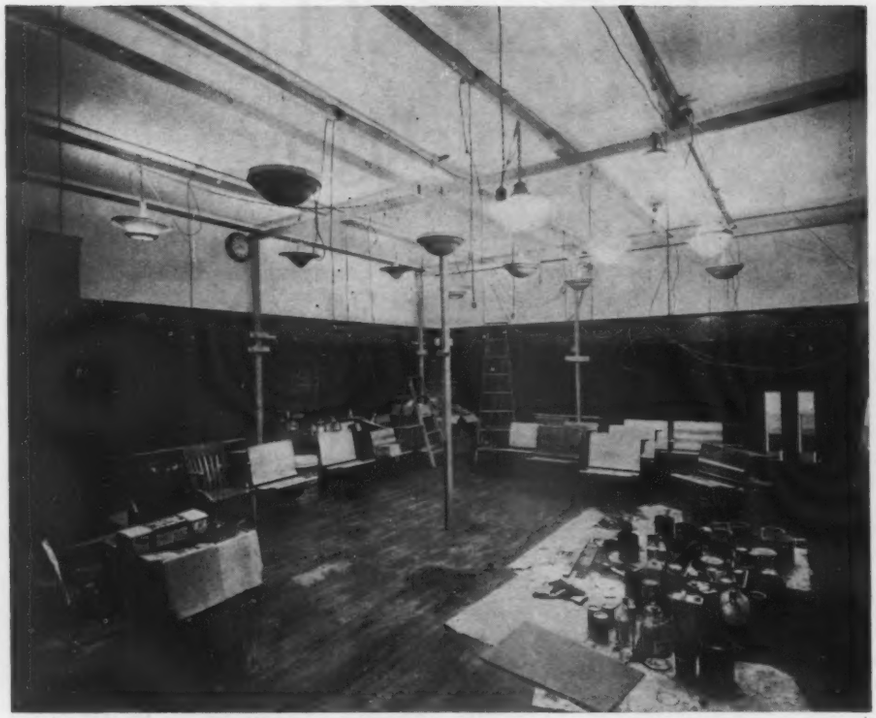
Light? . . . Vision? . . . Learning? . . . Intelligence? . . . Perhaps there would need to be less teaching if there could be more seeing.

The Problem of Darkness

"Well," said a visitor to one of our schools, "we hear the Sausalito School District is *light conscious*."

"Oh, no!" said one of the teachers, "We are *darkness conscious*."

And that is the proper—the necessary—condition of mind for those who would understand and solve the problems of schoolroom illumination. Nor



In an unused school room the tests started. A framework of lumber, with moveable cross members at ceiling level made possible the testing of a great variety of types and kinds of fixtures at different spacings, mounting heights, and wattages. Color schemes of paint for desks, floors, walls, "blackboards," woodwork, ceilings were tried out. Started in late January, by May of 1936 the first actual classroom was redecorated and lighted

are such problems very much different from those involved in lighting the office, the factory, the laboratory, the library, and the home.

We have become so accustomed to living and working in dark places that we are not *conscious* of the darkness. Mother can't see her sewing. Father tires quickly when he tries to read his paper. The children don't like to study their home-work.

Mother says her eyes are getting bad. Father says he is too tired after the day's work. The children don't like their studies. These statements may be partly true. But the main reason for the fatigues and the strains and the aches of seeing indoors is *darkness*.

Darkness, blindness, ignorance—we talk glibly about them, having in mind the darkness of night, or the blindness of those who cannot see, or the ignorance of illiterate savages. We think of absolute darkness, absolute blindness, and absolute ignorance. But there are degrees of darkness, degrees of blindness, and degrees of ignorance. And only as we study these differences in degree, do we understand our environment and our own lives.

We began by talking about *darkness*. Now these two other ideas have crept in—*blindness* and *ignorance*. Well, that is just the way it happened in the Sausalito school lighting investigation. We started with measurements of darkness but very soon it was apparent that just as there are different degrees of darkness, so there are different degrees of blindness and of ignorance. In fact, darkness, blindness, and ignorance were recognized as parts of the same problem. And the problem is this: How shall we utilize artificial illumination to dispel darkness, so that children may see, so that they may become intelligent?

A Modern Theory of Intelligence

Become intelligent? Yes, *become* intelligent!

Modern education is getting away from the idea that each of us is born with a fixed intelligence. The so-called intelligence quotient, or I. Q., is a flexible thing. It indicates how much the individual has learned or understands, and by so doing really measures the efficiency of the educational system. In terms of such measurement, our educational methods and procedures and environment are condemned in no uncertain terms.

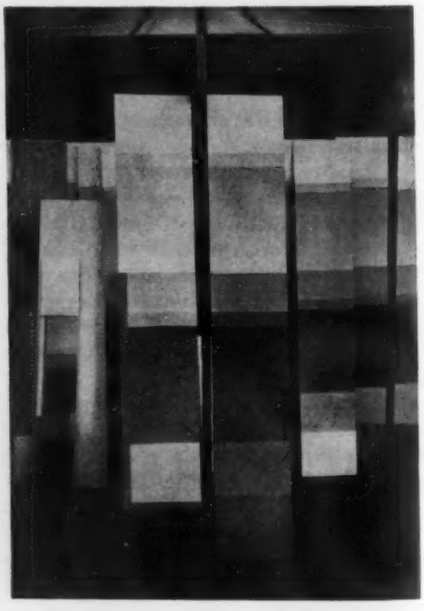
For instance, how can a child learn by reading the printed page, when the degree of darkness is so great that he can see only with difficulty, only for a short period, and only with partial understanding?

Yet, to a very great extent, learning from books is an essential activity in understanding modern civilization. From the symbolism of the printed page we sense meanings, we learn, we become wise; that is, we perceive, we appreciate, and become intelligent. This intelligence is merely a relative or particularized consciousness of the environment of the Self.

Other senses than sight are involved in the learning process, but probably 75 or 80 per cent of our impressions and ideas are gained through the sense of sight. Hence the acquisition of intelligence, as the chief aim of education, depends upon how much we can see.

Seeing

What is this *seeing?* With this question our problem begins to unfold. It is at once necessary to discriminate between "looking" and "seeing". To "look" is to direct the visual attention toward an object or situation. To "see" is to look in such a manner, and under such conditions, that visual perception is effected. We may "look" at the printed page, but we may not "see" it; or we may see the page, but not the printing; or we may see the printing, but only dimly; or we may see it distinctly, but only with straining; or we



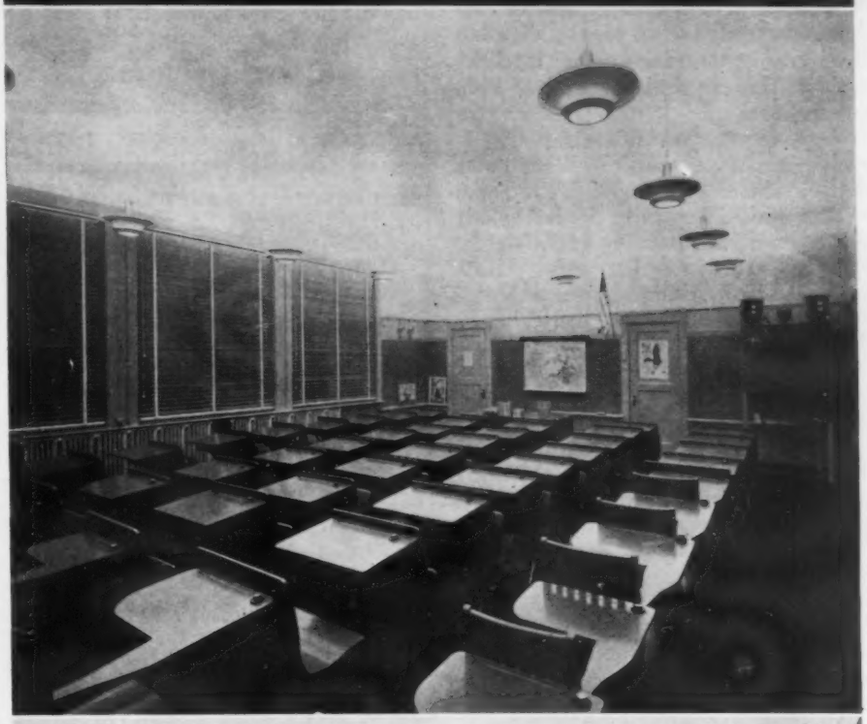
A great variety of color schemes were tested, each one painted on a wide strip of plywood. Grades of tone from the lightest for the ceiling, down to the "blueboards" and the woodwork and even floor, were worked out. Blue-grey offered the most neutrality, the most comfort to the eye, it seemed. But the room looks cold to visiting mothers. Now an artist from a neighboring private school interested in the experiment is collaborating to try to develop a color scheme that will provide warm earthy tints near the bottom and greens as well as blues. But for long continued work with the eyes blue neutral tints demand the least attention to themselves, allow more to the work being done

may see it both distinctly and without strain, yet derive no meaning; or, finally, we may see distinctly, comfortably, and with understanding, so that seeing results in comprehension. Thus seeing may be evaluated in terms of resultant comprehension. In its final analysis, then, seeing is an act of the mind. The eye is a camera used by the mind, and light is the form of energy utilized by the eye in taking pictures which the mind may see.

It then appears supremely important that the mind shall be permitted to look at—to see—retinal pictures that are distinct, undistorted and spectrally true. For if the Self can never experience surrounding reality except through sense impressions, chief of which are visual sensations, and those sensations are derived from retinal images that do not truthfully portray what is looked at, then the unavoidable result must be some degree of doubt, or ignorance, or delusion. Hence may follow decreased efficiency, limitation of ability, and failure to attain success and happiness in life.

It is again pointed out that a very considerable portion of our understanding of the world in which we live can be sensed only symbolically from prolonged and concentrated attention to the almost microscopic characters of the printed page. This exacting and unnatural task of reading imposes certain strains and fatigues that are perhaps too great for many individuals—especially children—to bear.

So it became the viewpoint of this investigation that: (a) intelligence is acquired through the senses, (b) guidance and training of the senses should be the purpose of education, (c) sight is the most important of the senses possessed by the Self as it attempts to utilize the printed records of racial achievement, and (d) any condition which facilitates seeing will magnify the possibilities for the acquisition of intelligence. Of course, it is granted



Top: Even from the outside at night the tremendous difference not only in intensity but in evenness of distribution of light may be seen. The experimental room in the center is evenly lighted. The two old rooms with their single 300-watt unit are gloomy and glaring. Below are the two rooms, the experimental room with its 12 ceiling units, control board, neutral toned walls, desks, and blinds. At the bottom is the old style classroom, with a single lighting unit, strong contrasts in the colors of walls, ceiling, desk, decorations—all competing for the child's interest with his text book or work. Children become submerged in the old type enviroment, whereas in the neutral toned room they look like flowers in their bright colored clothes. Average intensities of 35 to 45 ft. candles are maintained

that individual capacities for acquiring intelligence vary greatly; hence the variable factor, *intellect,* was no concern of the study. But the relation between *intellect* as a *capacity,* and *intelligence* as the fulfillment of that capacity, must be recognized.

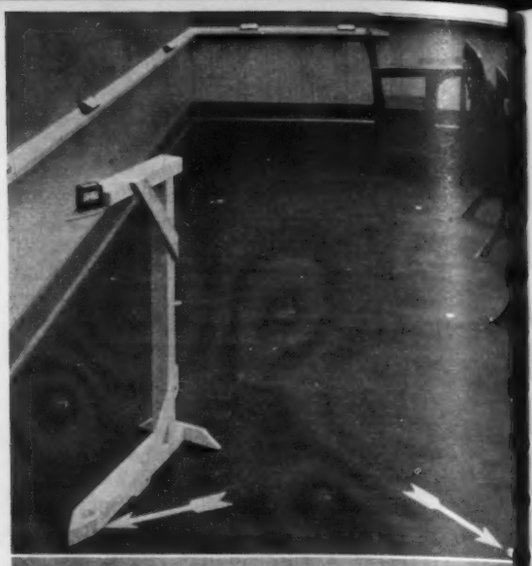
The Investigation

Recognizing, then, that education is very largely a matter of reading; that reading depends upon seeing; and that seeing requires light; our problem became a search for light—light of sufficient intensity, with proper distribution, and possessing color qualities such as the eye finds in natural light out-of-doors.

Very simple, some might say. But it really is not so simple. What color shall a school room be? What color ceiling, walls, furniture, floors? Shall there be blackboards, or greenboards, or blueboards or whiteboards? How high should the ceiling be—new buildings are being built—we should know. What ratio shall be maintained between windows, floor area, height of the room? What kind of desks should be used? Shall they differ for the various grades? Shall we use blinds, or shades—what colors? Shall the window glass be clear or frosted? Shall we take the windows out all together? What color walls would we use in that case? What about dual duty classrooms—used for one thing in the daytime—another at night? Shall there be different colors for night work, different lighting? What is intensity? What relationship does it have to various kinds of work? What kind of fixtures shall we use? What kind of light sources? What size lamps? How many fixtures per room? What about arrangement—shall they be in rows, circles, concentric? What type shall they be—direct, indirect, semi-indirect, troughs or coves? How shall light be controlled—manually by pupils—by teacher—by automatic means? What standards of control shall we expect—when shall the light be turned on—off? What instruments shall we use? What schedule maintained? What color of light shall we strive for—white—blue? Which is best? How intense shall the light be on the desks? What ratios should we maintain? Should they be affected by temperature, by size of the room, by age of the children? What basis can we derive for true judgment of these factors?

Experts were called in. They argued. They disagreed. The so-called science of illuminating engineering proved to be rather helpless to face the problem of illumination for seeing in classrooms. Illumination is easy—anyone can hang up some lighting fixtures and then turn on the switch. But what about seeing?

Finally the experts admitted that they did not know how to light a school room. But they wanted to find out. So there developed a cooperative investigation. Engineers, doctors, optometrists, biologists, artists, physicists, physiologists, psychologists, and numerous manufacturers of equipment have contributed to a series of experiments that already has made very substantial progress.

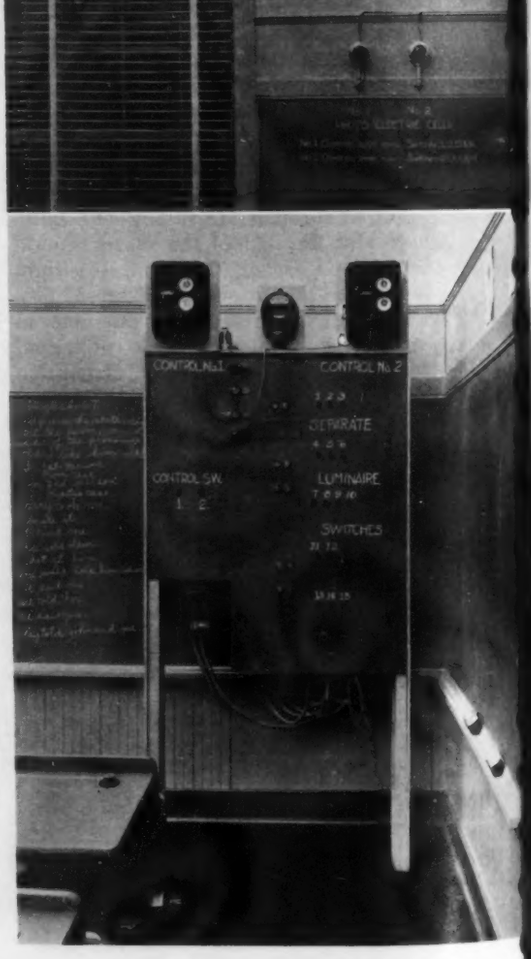


Right: In the experimental classroom brass marker plates were fastened permanently to the floor at regular intervals so that succeeding tests would always be taken over the same spots. A cantilever arm rack to hold the sight meter was devised. A hole at its pointed base allows it to be set directly over one of the brass markers. The cantilever allows the sightmeter to swing over a desk screwed to the floor and provide readings at uniform working level

Center: Two photo-electric cells were mounted, not on the wall facing the windows but on the wall adjacent to the windows, so that they would be operated by reflected light coming from the far or dark interior wall. One cell controls the inner row of lighting units, the other those near the window. Units used were a 300-watt semi-indirect aluminum fixture designed experimentally for the job by Preston L. Hopkins. There are twelve 300-watt units of this kind in the room, five along the rear wall, five the window wall, and one at each end between the rows. The two end units go on with the inner row control

There are rooms in gray-blue and rooms in gray-green. There are Venetion blinds with upper surfaces in white, and lower surfaces in blue. There are writing panels (blackboards) in dark gray-blue and dark gray-green. There is writing crayon in yellow and in orange. There are desks to match the color schemes of walls and ceilings. And imagine a classroom with twelve fixtures—a room 23 by 31 feet—photo-electrically controlled, so arranged that as daylight gradually grows less, artificial light gradually replaces it.

And the children? . . . Well, when unlighted rooms are dim in the twilight of cloudy weather, or early morning, or late afternoon, the children do not study—they just daydream or play. But when adequate artificial light is turned on, they return to the pleasant activity of acquiring intelligence from the printed records of the achievements of man.



Bottom: A control panel was mounted at the front inner corner of the room. Auxiliary relays for the photo electric cells are mounted at the top with a meter to measure current consumption. Each unit is separately switched to allow fullest experimentation

A Symposium on

How to Sell the Minimum Customer

by Western Commercial Men

Long-Term Financing Is One Approach

This subject should be divided into two parts, first, the effect on the utilities and second, the effect on the balance of the industry.

Most utilities, I believe, will find that 25 per cent of their domestic consumers fall in the minimum-bill class, and as a result are not maintaining the capital investment necessary to serve them. From a utility standpoint this represents a serious loss and places an added burden on the other 75 per cent.

We cannot refuse to serve these minimum account customers. They must be considered. From the industry standpoint this group should represent a fertile field for sale of labor saving devices.

The sales approach, will, of necessity, have to be based on long term contracts. This situation has been aggravated during the depression, as evidenced by the fact that 35 per cent of the families in the United States, at the present time, are on some form of relief. As their economic status improves they will undoubtedly need to replenish household equipment. The electrical industry should get its share of this business.

Unless the dealer can get assistance in financing long term paper for this class of purchaser, the job will never be done, that is, unless the utilities elect to do it themselves.

Another factor is the vast number of appliances that are inoperative due to lack of repair, broken cords, burnt out elements, and loose connections. Poorly designed items also cut wattage and make users dissatisfied. The repair of appliances on the shelves offers utilities a tremendous opportunity to restore load. Revenue from the minimum account consumer can be greatly increased by offering, on sufficiently long terms, the following items:

1. Refrigerators.
2. Washing Machines.
3. Better Lighting.
4. Electric cookers, such as roasters, casseroles and similar devices.
5. Table appliances.
6. Electric Ironers.

Someone in the industry is going to wonder why we place ironers last. We realize the importance of the electric ironer as a labor saving device, but do not forget we are dealing with customers who are at the bottom of the income group. It is necessary to work those devices which they can best afford, and that will do the most for them in preserving the health and happiness of the entire family.

H. C. Rice, Merchandise Manager
Southern California Edison Co., Ltd.

THE PROBLEM

Dependent upon utility and territory, from 25 to 50 per cent of domestic customers fall into the minimum-use, "unsold" or "loss" category.

They are a liability because they are unprofitable . . . .

They are unattractive as prospects because the cost of selling them is high and sales effort can be more profitably directed in other channels . . . .

They do not believe electricity is low-priced because they pay top-block rates . . . .

They preclude rate reductions by their failure or inability to use more service . . . .

They are habit-minded; their purchasing power is low . . . .

They are voters of a type open to demagogic arguments . . . .

They are a challenge to the industry's sales ingenuity to sell them service and better living through greater use of electrical equipment . . . .

Customer Research Will Show Market

Before any constructive program can be launched it is necessary to group these customers into the various classifications according to income, buying habits and needs. Several classes of customers come immediately into mind that very possibly are included in the minimum-bill group.

The first class can well be the large group which consider electricity as an expense without taking the second step in their thinking and considering what electricity may mean to them. In this group of customers an intensive educational program can well be conducted without any definite selling plan, other than the sale of the service. Much can be done through free educational work by farm service men, as well as home service departments.

A second group of customers will fall into a class which can be defined as budget watchers, who keep at a minimum all items they feel are necessities. We know of many that never pay over the minimum for water, for their wood or coal in the winter, for their milk or butter, or the hundred and one other things which are considered necessities. Unfortunately, electricity falls into this list of necessities. The problems involved in selling this class are more difficult, and it is only through a national wave of popularity for electricity that many of them can be converted into profitable users.

A third class will be a group of customers that, under no circumstances, could use over the minimum because of limited incomes and living habits.

It is easy to generalize on the different classes of customers that are a part of the composite minimum-use group, but it is more difficult to treat each special classification from a sales point of view without investing considerable money in a promotional period of some duration before actual results are felt in income figures. I believe that as a general rule we can all make the mistake of being too ambitious in what we sell to the minimum-bill customers. We see it rather in the light of a slow growth with possible buying in somewhat the following order: lights, iron, washing machine, radio, electric clock, table appliances, and then a major appliance which fills an immediate need. In some cases this would be a refrigerator, in others an electric range.

On the farm the job is less difficult since the profit aspect can very easily be shown on certain appliances. We have found this true in the poultry industry where a customer may be a minimum use customer as far as his household is concerned but uses an electric brooder, water warmer, and the various other appliances that will make his business profitable.

Patrick Johnson, General Sales Manager
Puget Sound Power & Light Co.

Free Range Wiring Brings Results

Three years ago 37½ per cent of our domestic customers were in the minimum-use class, averaging 28 or less kw.-hr. per month. While a high percentage of these customers were at that time either on relief or had very small incomes, a partial survey indicated that many could afford to purchase and use more domestic electrical equipment. During the past three years we have reduced the percentage of minimum-use customers to 30, partly due to improved business conditions but mainly due to a sixteen months' "free range wiring" campaign participated in by ourselves and dealers; resulting in our providing 5,198 "free range wiring" installations. These went mainly to customers in the lower income brackets, a large percentage of whom were renters. Undoubtedly these customers had desired to cook electrically for a considerable period of time, but had felt unable or unwilling to make the necessary investment in wiring, particularly in rented houses. An analysis of the accounts of 1/3 of the customers taking advantage of our "free range wiring" offer, revealed that the addition of the range increased our revenues on the average $26.29 annually and clearly showed that a greater portion of these installations were in small homes of customers with modest incomes. We have not been successful in materially changing the number of minimum-use customers through the sale of lamp socket appliances or I.E.S. lamps.

A. C. McMicken, General Sales Manager
Portland General Electric Co.

●

Lighting and Radio Sales Possibilities

Because the minimum user falls into the low income bracket, first cost and the cost of operation of an electrical appliance become greater sales barriers than with those of larger incomes. The fact that many in this group have poor credit ratings and many are on relief further complicates the problem and limits the number on which to concentrate a sales promotion program.

Obviously, any plan to promote greater use among the minimum users must include the promotion and sale of low-cost, quality appliances on convenient terms. Some companies have used with success the ensemble or package plan in which two or three different appliances of accepted quality are combined and sold at an attractive price for reasonable terms.

The utility, however, must keep in mind the cost of the promotional activity as related to the load added or revenue to be gained. Lighting through the kitchen unit, student and reflector type lamp undoubtedly offers the best and easiest way to increase the load from minimum consumers. The appeal to protection of health and sight is particularly effective in homes with children of school age. We have considered for some time the advisability of offering to our minimum consumers through the medium of direct mail an inexpensive reflector lamp on long terms. An introductory offer of this kind could be made at a reasonable sales cost to the company.

Next to lighting, radio would seem to offer the greatest potential load. Families in the minimum consumer group usually spend some money for entertainment. Probably the major portion of such expenditure goes for movies. It is not unreasonable to expect that a family of four would spend at least $1.20 monthly on motion picture shows. One-half of that amount would operate a radio in the home under normal use for one month. In addition to the revenue gained from the radio, the utility would benefit further from the normal increase in lighting.

SOME SOLUTIONS

Calls on these customers by trained personnel to impress the idea of service, the friendliness of the company, its interest in the customer's acquaintance with rates and to sell them the USE of such appliances as they now own.

Surveys to determine habits, economic status, present uses and potential uses.

Promotional campaigns based on the Better Light-Better Sight program, selling a low-priced I.E.S. lamp.

Sale of low-priced radio sets.

Sale of electric refrigeration because its health and food-saving advantages are appeals this class of customer can appreciate.

Extension of the longest possible terms.

Sale of the electric roaster.

Sale of packaged appliance ensembles such as an iron, coffee maker and toaster.

A program to restore to service appliances now on the shelf because they need minor repairs.

Extension of inducements to buy such as free wiring in the case of electric ranges.

The utility could well afford to experiment with the sales possibilities of both the low-priced reflector lamp and radio in an effort to eliminate part of the minimum users. In such a sales program it might be well to consider the advantage of second-hand radios with which dealers are oversupplied.

One point is certain—that the minimum consumer, unless he graduates to a higher income bracket, will not use more electricity without direct effort on the part of the utility.

H. H. Courtright, President
Valley Electric Supply Co.

●

Salesmanship Needed

It is my personal belief that one hindrance to getting current-consuming devices into homes of low-use customers has been the unwillingness to conceive that the direct expense will probably be higher than normal selling. I hold this belief because the failure of all our past efforts has been primarily traceable to our inability to attract the right type of sales personnel and hold their interest.

During the coming months we are going to make another attempt to reach this customer through sale of electric roasters. We will increase our sales compensation slightly in hopes that it will arouse a more intense interest on the part of the salesmen who will be charged with getting the job done.

G. W. Madison, Merchandise Manager
Portland General Electric Co.

●

Balanced Selling

As our efforts to sell low-use customers are just getting under way, I shall discuss plans rather than results.

All of our residence and farm customers who use less than 30 kw.-hr. a month have been designated as x-customers. Commercial customers who use less than 50 kw.-hr. per month have been similarly designated.

Having located all low-use customers for the various types of service, we are now planning to compile names and addresses of each of these individuals by districts. These lists will then be referred to the chief clerk for credit approval of varying amounts depending on ability to buy. We then plan to assign a certain number of calls to each of our territorial salesmen so that they will each carry a responsibility of contacting a given number of low-use customers each day. By this method we hope that we may not dilute our sales program by diverting attention to a poor class of buyers, but rather that we may build sales within this group at the same time we are making sales to those who use larger quantities of service.

D. B. Leonard, Commercial Manager
Pacific Power & Light Co.

Use Women to Sell Women

I certainly agree that low-cost electricity means little to customers who never use the minimum, and that these customers constitute a menace to the industry.

I believe they fall into general classes: first, those with low incomes, who use only lighting and possibly a washing machine, iron or small radio; they average probably 300 kw.-hr. per year and less; second, those not necessarily in the low-income group; they have either a range, water heater, or both, but do not use a reasonable amount of service considering equipment, income and standard of living.

Last year we conducted a study of our average customer who uses only lighting and small appliances. This study extended over eight months and covered 524 customers located in and around Boise. Generally speaking, those customers whose use was 300 kw.-hr. per year or less, had low purchasing power, lived in rented homes with poor wiring and practically no outlets. In the majority of cases there were not even wall switches.

A high percentage of these low users were widows or elderly couples, satisfied with present equipment and the use they made of it. This class had no complaint against company service, or rates. But we found it difficult to make much impression on them even with a good story on the value of service at our low rates.

Offering some promise for load building were the young married couples who have low purchasing power at the present time but who as a rule have ambition to attain a better standard of living. They desire more appliances whenever their purchasing power will permit. A few sales were made in this group. Some of these who were discontented with their lot in life also were slightly antagonistic to the company. But after some of our problems such as taxes, etc., were explained to them, they seemed more favorable.

We found the saturation of appliances in the 524 customers included in the study to be as follows: Washers, 70 per cent; Electric Irons, 90 per cent; Radios, 75 per cent; Hot Plates, 10 per cent; Vacuum Cleaners, 15 per cent. This saturation is surprising considering that average kilowatt-hour consumption for this group is only about 325 per year.

We feel that improved lighting is probably the best load building activity to conduct among these customers. The degree of success will depend largely on the solution of the wiring problem. We also believe that as purchasing power increases, the younger and more ambitious customers in this group will become prospects for the larger current consuming devices.

We have about 12,000 combination cooking, lighting, and small appliance customers, 10 per cent of whom use less than 900 kw.-hr. per year and 7 per cent use from 900 to 1,200 kw.-hr. per year. Our Home Service Department is now making a special study of this group, calling on each customer, telling the story of the company, its rates, the service it offers, explaining the value of this service to the customer.

Home service women started this work last month and already I am becoming convinced that they will solve the problem insofar as it is possible. Selecting and training women for this class of work is our present difficulty. To do this job right, a woman should have at least two years previous experience with the company and have a thorough understanding of its problems.

One reason for low-use has been found to be seasonal use of electric cooking. There is also a decided lack of understanding of the step-style rates.

We also have 7,500 combination water heating, cooking and lighting customers, 20 per cent of them use 2,400 kw.-hr. per year or less, and 15 per cent use from 2,400 to 3,000 kw.-hr. per year. The Home Service women are also contacting this group, finding conditions as described for the combination cooking and lighting customers.

In checking the history of our domestic consumption we find that seasonal use both of cooking and water heating service has been accentuated by the depression. We also find that the seasonal use problem becomes worse as we drive our saturations higher, in other words, as we go into lower income groups. For example, in the table, Pocatello Division, with the lower saturations of ranges and water heaters, has much less variation than other divisions.

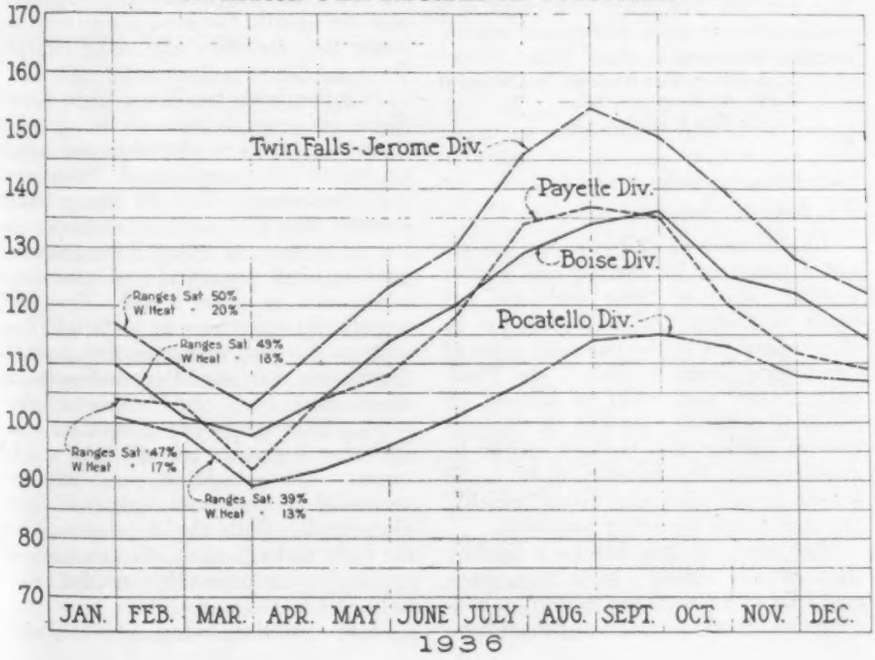
I believe the last two groups constitute the most serious problem, because our plant investment is largely determined by the maximum use of the customer in any one month or season. We feel that we understand the merchandising problem fairly well. But after customers have purchased merchandise and are still low-use customers. I believe they constitute one of our most difficult problems. Since it is the woman of the home who turns the switch and determines the use, we believe the story can best be told to the housewife, and that it will be more impressive if told by a woman.

R.E. Gale, Commercial Manager
Idaho Power Co.

IDAHO POWER COMPANY

Domestic Kilowatt Hour Sales

AVERAGE PER RESIDENCE CUSTOMER



1936

Direct Selling Is Too Costly

We have given a great deal of thought to increasing our revenue from the minimum-use customer and are becoming more and more convinced that direct sales effort with these customers on the part of the utility is almost prohibitive on account of the relative cost when compared with other sources of revenue. We have not entirely given up the idea of trying to develop business from that

class of customers, but such plans as we have developed thus far to stimulate greater usage among them do not seem to "click." We do believe, however, that some of our regular load building plans are having their effect in bringing up the average usage of these customers.

The electric refrigerator, floor and table lamps, portable heaters, and the radio, perhaps, are the best pieces of merchandise that can be used for promoting greater usage with this class. These appliances, which bring so much comfort to the home, have a very low sales resistance, and their cost of operation is small. The electric refrigerator, while it requires rather a large initial investment, has an especially good selling feature because it is not difficult to prove to a customer that the savings in food will pay for the refrigerator. The cost of operation certainly is within the limits of the low-income group. As we increase the saturation of electric refrigerators, I believe the present minimum-use customers will gradually disappear. The floor and table lamps that we sell, and which give the customer so much more in the form of quality lighting, also furnish a pretty good wedge to work on minimum-use customers.

Surveys have shown that a great many of these so-called minimum users are of the type that cannot be sold any additional electrical-consuming devices and can be classed as follows:

1. The apartment house dwellers: They do very little cooking, and are usually furnished refrigeration, heating, and hot water, from central plants in the building.
2. Any number of buildings, small shacks, and small individual garages, separately metered which only have one drop light which is used very slightly. No one lives in these places, but they are necessary parts of our system of living.
3. Customers that cannot be sold any additional socket appliances because of incomes sufficient only to keep them alive. These are usually old people who are not interested in modern appliances and could not pay for them if they were.
4. Old homes where some load-building equipment might be sold, but where there are no convenience outlets and the customer is not in a financial position to pay for installing one or two. On account of restrictive ordinances additional outlets often run into quite an expense.

If we should eliminate those who come in the above four classes of customers, I believe the percentage of minimum-use customers would be substantially reduced.

We tried using the "Pin-It-Up" lamp in an experimental campaign on minimum-use customers, but it was almost a complete failure. We were able to sell only one per cent of 500 minimum-use customers that were worked on. Later on we supplied three dealer organizations with lists of minimum bill customers so that they might solicit them either directly or by direct mail, and after working these lists they decided there was little or no appliance business to be obtained from that type of prospects.

During the past six years, 59,000 portable electric heaters, 173,000 electric refrigerators, 450,000 radios, and 100,000 (by the utility only) high-wattage lighting units have been sold and installed on our lines in northern California. Our average annual domestic kilowatt-hour consumption has been increased from 759 in 1931 to 825 in 1936. It is our conviction that a substantial part of this equipment was placed in the homes of minimum-bill customers.

PACIFIC GAS AND ELECTRIC CO.

Per Cent of Domestic Customers Using Various Quantities of Electricity

Kw.-Hr.	April 1931 Per cent of Customers Using Q or Less	April 1935 Per cent of Customers Using Q or Less	Jan. 1936 Per cent of Customers Using Q or Less	Improvement in Percentage
10	10.50	9.02	8.61	1.89
20	27.06	24.98	23.26	3.80
30	45.80	43.47	39.85	5.95
40	61.45	58.54	53.62	7.83
50	72.39	69.18	63.81	8.58
60	79.55	76.56	71.39	8.16
70	84.16	81.77	77.24	6.92
80	87.12	85.31	81.48	5.64
90	89.20	88.12	85.02	4.18
100	90.75	90.11	87.68	3.07
No. of Dom. Customers	469,883	508,273	508,618	

	Year 1931	Year 1936
Av. An. Kw.-hr. Cons.	759	825
Av. An. Rev.	$33.63	$31.77
Rev. per Kw.-hr.	4.43 cents	3.85 cents

It appears quite evident that from the viewpoint of dollar of revenue per dollar of sales expense, it is much more profitable to place our efforts in the more lucrative markets. In this way, we are able to make greater progress in increasing the average consumption which brings about rate reductions, and thus puts the low-usage customers in a position to use more energy without noticeable increases in their bills.

R. E. Fisher, Vice-President in Charge of Public Relations and Sales
Pacific Gas & Electric Co.

●

Use Direct Mail To Arouse Interest

To me, users of 12 kw.-hr. or less are not a factor to be affected one way or another. Most of them can't use any more electricity and still pay for it. Many more are in the marginal class of "part time livers at home", etc. Probably 15 per cent could be stepped up some, if diligently worked on, but the cost of getting this business might be considerable. The bracket of 12 to 50 kw.-hr. users appears to me as "unsold" customers and far better prospects.

Most users in this block—a healthy slice of any utility's total business—could be sold something to step up consumption. Obviously, most of them have no refrigerators and probably no I.E.S. lamps. For a multitude of reasons, they are not now enjoying electrical servants, and still, most of them own automobiles.

In this territory, the Electrical Shows which we have been holding for several years, have undoubtedly done much to reach the first block users. Our shows are always free, and with an attendance of 86,000 for the most recent one last Christmas it is evident that we have been reaching thousands of these people. This is effective only in a general way. Intensive cultivation is necessary, if progress is to be recorded.

I have a notion that a cleverly executed direct-mail campaign, followed if possible by personal solicitation, would be the best procedure. A utility could easily compile a mailing list of those it wanted to reach. Regular mailing pieces could be sent out at frequent intervals. Refrigeration, better lighting, radio entertainment, table appliances, etc., could be suggested. Then, if such a set-up were possible, non-commercial salesmen could be assigned to call on each user. The position of this man should be that of investigator and goodwill agent, with nothing to sell. If deemed advisable, likely looking prospects could be turned over to dealers for follow-ups.

J. Clark Chamberlain, Secretary-Manager
Bureau of Radio and Electrical Appliances
San Diego.

●

Customer Survey Paves Way for Salesman

For many years the "minimum-use" customer has been one of the major problems of utility companies and has in many cases prevented rate reductions. They constitute a large percentage of the total number of domestic customers and are usually the most dissatisfied because they feel they are being charged for a service they have not received.

In my opinion the Better Light Better Sight program is one of the greatest tools that has been placed in our hands to reduce the number of "minimum use" customers. One of the primary reasons that this class of customer exists is because in every community we have a large percentage of customers whose earning power is low. They cannot afford to purchase or use appliances such as ranges, water heaters and refrigerators that would immediately remove them from the "minimum-use" class. Although power companies realized that a greater use of light would correct this condition, no effective means of selling more light had been discovered. With the development of the light meter a most effective way of convincing customers they needed more light was introduced.

Many utilities today are realizing

that the promotion of the use of electric service is just as necessary as the sale of electric appliances themselves. I am confident that a survey of all "minimum-use" customers by men qualified to make these calls will bring about a much higher earning in a large percentage of cases. We have adopted this plan and at the present time have three men who must survey at least twenty-five homes per day, turning in a card indicating everything that this customer uses in the way of electric and gas equipment. A definite effort is made to interest the customer in better lighting and arrangements made for one of our home lighting ladies to call and survey the lighting.

The introduction of one "Trilite" lamp into the home of a "minimum use" customer immediately takes this customer out of that class and makes a customer profitable. There is no appliance that we can sell this customer that will bring us as great a revenue per dollar of customer investment as the "Trilite." There are few customers who cannot afford to purchase a "Trilite" and by selling these on reasonable terms, which we can well afford to do, we have solved the problem of the "minimum-use" customer.

We have thought too much in terms of ranges, water heaters and refrigerators, and have thought too little about the value of lighting load, and if we will re-adjust our mind to think in terms of two or three hundred kw.-hr. per year when we sell a "Trilite" we will realize that this is certainly one answer to this problem that has remained unanswered for many years.

W. C. Mainwaring, General Sales Manager B. C. Electric Railway Co., Ltd.

●

All Businesses Have Minimum Customers

In my opinion there will always be low use customers. Any business must have those who do not gravitate into the economic bracket. We have many residential customers on our lines with low incomes who enjoy complete use of electric service in their homes. We also have customers with high incomes who as yet are not big users. These are the truly unsold.

I find them present in other business. A recent discussion with the Telephone Company brought out the fact they have only 57 per cent residential saturation here in Portland. They advised me that many homes in the finer residential districts do not have telephones.

In electric service, the majority in the minimum use bracket simply have not the money to buy appliances.

I know no method, either sudden or extended, of bringing these customers into more generous use. Since low use always exists among various classes of our residential customers, we are more concerned with getting the greatest volume of business in the shortest time at the lowest cost, with a promotion plan attractive to all customers alike.

Jas. B. Buman, Manager Residential Sales Northwestern Electric Co.

●

Facts Revealed by Actual Surveys

We have made quite a study of the minimum-bill customer, who is, under our system, a customer using 12 kw.-hr. or less per month at a minimum charge of 90c.

Before attempting to solve the problem of the so-called minimum use customer, I felt it was necessary to determine who this customer was; his living habits, age, financial status, etc. With this in mind we made a survey covering every section of San Diego. The city was divided into ten districts, and ten names of minimum use customers were selected from each. Results are shown in the table.

1. Number of Customers Surveyed	100
2. Average Number in Family	1.42
3. Average Age — Over	65
4. Financial Status — Poor	50%
Lower Middle Class	50%
5. Frugality — Without exception the minimum bill customer should be considered an extremely economical person.	
6. Residence—Small apartments	30%
Small homes—5 rooms or less	68%
House—6 rooms or more	2%
7. Convenience Users	50%

Some of these minimum bill customers are on the WPA and others have limited incomes and consequently watch their use of our service in order not to run over the minimum. In some cases the man of the house works at night and therefore has little use for lighting service. Others are away a great portion of the time.

Approximately 10 per cent of our customers fall into the class using 10 kw.-hr. or less per month. Most of these are old people living alone. Very little could be done to increase their use. If, however, we were to extend this class to include all customers using less than 50 kw.-hr. per month, we could then attempt to build use through direct solicitation.

First of all this customer must be educated to general use of electricity in the home. After the groundwork is laid the customer could then be sold on the advantages of better lighting. He could be sold on electric refrigerator, radio, or labor saving devices. In many cases, however, a customer could not take advantage of labor saving devices. It will be almost necessary that "unsold customers" be approached on the benefits of new outlets and new devices at the same time.

E. W. Meise, Superintendent of Merchandising San Diego Consolidated Gas & Electric Co.

What the Home Service Workers Can Do

An analysis showed that approximately 40 per cent of our customers were using less than 50 kw.-hr. per month; that some 19 per cent were using between 20 and 30 kw.-hr. We selected this last group on which to work, necessitating calls on 14,663 customers. It seemed advisable that these calls and contacts be made by the home service advisors. This for several reasons: In the most part the calls on these customers should be of a nature to impress the idea of service, friendliness of the company, interest in the customer's acquaintance with rates, and to sell them the *use* of any equipment which might at the time be in their homes. The home service advisor can best make these calls because she has the best opportunity to get into these homes just to talk with these customers. As to selling new equipment, it was still felt that the advisor would make the best contact because in the nature of things these customers would be in the market for some better lighting or small appliances, both of which the advisor could sell.

With no attempt to determine the financial condition of the people or to predetermine their status as additional-use customers, we set a quota of some 14,000 such contacts to be made by the home service department during the year. These were to be made in connection with all other department calls. First of all, we needed a greater knowledge of the actual conditions in these homes, the attitude of the customers toward the company, and their possibility as a market for future sales of service. Such information could be had by the advisor's call at the home offering only service and her report back to the department would be considered a survey as much as anything else.

To this original group of 14,000 customers using between 20 and 30 kw.-hr., we later added those using 50 kw.-hr. and the local division manager in many cases added special customers whom he wished contacted because they had major appliances installed at one time and were not using them. This gave opportunity to restore some appliances to use on the lines.

To stimulate these contacts a special campaign was conducted for the home service department during April, May, and June. A record was kept for each customer on our regular customer report card. During these months 10,765 customer calls were made on this group. From time to time records and cards were checked to determine the need for call-backs, for checking up on appliances recorded as prospects, and to de-

termine any increase in usage as shown on the back of these cards when turned over to the accounting department for checking. Many of the billings for last year's contacts will not be checked until this year to show increased use.

A complete analysis of 475 cards used as cross-section check-up showed some very interesting things. Among this group were 124 who were reported as owning their own homes. Many of the cards were not completed with this information. According to the information reported by the advisor, only 10 were on relief, 2 were out of work, 2 were working for the WPA. We found 8 refrigerators and 9 ranges which were used only during the summer months.

Part of the service given by the home advisor is the cleaning and repairing of small appliances, and on these 475 customer cards there were reported 34 appliances so cleaned, repaired and restored to service. For this same group there were also reported a great many appliances already in the home, some not in use. There were 57 ranges, 46 refrigerators, 107 radios, 106 washers, 110 irons, 30 vacuum cleaners, and many small appliances. Complete information on these points cannot be obtained, because all customers will not give it.

To this group of 475 customers, the advisors gave 196 lighting demonstrations. Lamps, fixtures, lamp bulbs, and numerous small appliances were sold. With this group alone the lighting equipment and bulbs sold gave an increased lighting wattage of 13,790 watts. There were 180 sales of such equipment and small appliances. This would indicate that the low use customer is a good potential buyer if sold first on service and the economy of increased use.

Nancy Finch, Home Service Director
Utah Power & Light Co.

●

I. E. S. Lamp May Solve Problem

Minimum-use customers are what I call "convenience users", those who do not exceed the 90c charge for 12 kw.-hr. They are the people who occupy apartments or small houses and are at home very little. Their requirements for electric service consist only of lighting. Many work during the night and are never home in the evening. In general, these people are not of the so-called poor class.

A small percentage of these minimum users are, of course, elderly people or single people who might be induced to use other equipment. We find that the small radio and the new I.E.S. lamps have been major factors in developing additional use among these customers.

To pick the minimum-use customers out as a class and try to sell them any particular piece of equipment in order to increase their method of developing domestic load is proving to be as successful as any. This includes promotion of I.E.S. lighting, radios and small appliances. We have not put on a special campaign for minimum users. However, since 1928 our minimum users have dropped from 23.6 per cent of the total to 11.2 per cent in 1936.

I disagree with those who say that these customers complain about our rates and service. It has been my experience that we have no more complaints from the minimum user than from the larger user.

The above, in general, is my idea of the minimum use customer, and in this I have considered the minimum use customer as the customer who uses within our minimum of 90 cents per month, which is 12 kw.-hr.

A. E. Holloway, Vice-President
San Diego Consolidated Gas & Electric Co.

●

Electric Roaster Has Possibilities

Approximately 28 per cent of our residential customers use less than 32 kw.-hr. per month. While our domestic use is approximately 1,800 kw.-hr. per year, we have a very large percentage using less than 300 kw.-hr. per year. One of our major activities for the year 1937 will be to work this field systematically with the thought in mind we can well afford to spend a greater amount of money to increase the kilowatt-hour use among these customers since in most cases added use by them will be paid for on the "high" step of our rate. For instance, a customer now using an average of 25 kw.-hr. per month and we increase his use of service by 100 kw.-hr. per year, our return will be $5, whereas a customer now on the two cent step of our rate increases his use by 100 kw.-hr. our return is but $2. With a return of two and one-half times more, we feel fully justified in spending considerable money to increase use among these customers.

In the city of Spokane we have hired five junior salesmen who will devote their entire time calling on customers using less than 300 kw.-hr. per year. At the present time their efforts are confined to one section of the city. If their work proves satisfactory in this so-called experimental section, then we will add more men for complete coverage of the city.

In some of our larger communities outside of Spokane we may also add junior salesmen who will devote their entire time to "low use" customers. While these salesmen will sell a complete line of appliances (except major devices) their primary job at this season of the year will be to sell Westinghouse roaster ensembles, including broiling grid, which lists at $29.90. The junior salesman will receive $50 per month guarantee. Their compensation for the sale of the roaster ensemble will be based on the following schedule which is set up to encourage larger down payments:

Where the down payment is 10%, bonus to be.....$7.50
Where the down payment is 25%, bonus to be $8.00
Where the down payment is 50%, bonus to be $8.50
Cash in full, bonus to be.....$9.00

Payments for the roaster may be made over a period not to exceed twelve months with an interest charge based on one-half of one per cent per month to be added for deferred payments. When the junior salesman sells a roaster ensemble to a customer using more than 300 kw.-hr. per year, the bonus will be 50 per cent of the above schedule.

For the sale of I. E. S. lamps these men will receive 2c a watt when sold to customers using less than 300 kw.-hr. per year; 1c a watt when sold to customers using more than 300 kw.-hr. per year. For the sale of socket appliances they will receive 1/10c a watt excluding motor driven equipment.

In our suburban towns where the majority of calls on these "low use customers" will be made by our regular employees, we will pay them a bonus of $3.50 for the sale of the roaster ensemble when sold to customers using less than 300 kw.-hr. per year. This is one-half as much as they receive for the sale of an electric range to a new customer and so by the sale of two roasters to low use customers they can make as much as if they sold an electric range.

It is not our intention that the junior salesman be allowed to sell ranges, water heaters, washers, ironers and refrigerators; however, they will uncover many prospects for these items and will receive 20 per cent of the amount paid to the employee for the sale of the equipment where the prospect is not carded in the salesman's prospect file. This 20 per cent that goes to the junior salesman will be deducted from the amount paid the senior salesman.

The junior salesman will follow the plan used by the successful aluminum salesman by conducting neighborhood demonstrations where prospects will be notified by them to attend the demonstration. Our regular home service advisors will conduct the actual cooking demonstration for the salesman. In this way we will be in a position to show these customers how the roaster will actually perform for them.

Lewis A. Lewis, Asst. General Manager
The Washington Water Power Co.

Why They Buy – Tell them to SELL

A COOL WAY TO COOK
All heat kept inside cooker. Kitchen stays cool. Ideal for summer meals.

DELICIOUS MEALS
Cooks practically anything that a range does. Saves flavors and juices which give delicious taste.

TAKE ANYWHERE
Carry warm meals to picnics or outings. Bring warm foods to church socials, etc.

FREE FROM ATTENTION
Automatic features cook while you shop, attend to other things, or go out on business or pleasure.

SAVES SPACE
One appliance does many cooking tasks. Ideal for small apartments, beach or mountain cabins, housekeeping rooms.

SERVE RIGHT AT TABLE
Attractive enough to serve from directly at table. No need to leave your guests.

SO EASY TO KEEP CLEAN
Cooker shell can be removed and washed with dishes. Cooking inserts easily washed because no soot or smoke reaches them; no need of burned foods with controlled heat. Wipe exterior clean with damp cloth.

SO MANY USES POSSIBLE
Ideal for long time cooking of cereals, soups, roasts. Deep fries doughnuts, French fried potatoes, etc. Fine for canning fruits, vegetables. Heat water in emergencies. Useful in a sickroom, caring for invalids. Sterilizes, or keeps hot packs hot. Also keeps foods cold, makes iced desserts.

ELECTRICAL WEST COOPERATIVE

APPLIANCE SALES GUIDE

Copyright 1937 by Electrical West, 883 Mission St., San Francisco
All rights reserved including permission to reprint in whole or in part.

ROASTERS

JUNE, 1937

Best Way to Sell Roasters is to Demonstrate Constantly

Nothing creates a yearning to own a new roaster or cooker so quickly or thoroughly as the delicious odors of cooked food wafted through the air from a demonstration of roasters somewhere in your store. The savory breezes just lead prospects toward the display by the nose. Curiosity does the rest and the demonstrator or salesman can tell the many ways in which a roaster can serve a purchaser (see column above) to a receptive and already convinced prospect. Roasts are especially good, for the delicious odors from well cooked meats is especially inviting. Prepare a roast as you would one for the oven. Either cook a leg of lamb or large meat roast, as shown at left, singly, or as in the roaster display and demonstration pictured below, cook a wrapped roast with potatoes in one dish, and two vegetables in the other dishes. Serve prospects a taste. After the meal is cooked it will be kept warm for the rest of the day on low heat.

Quick . .

Between regular demonstrations with someone constantly in charge you may want to have some quick way to show what the roaster will do to a skeptical prospect who will not be convinced without visible proof. It pays to keep one roaster connected and set on low heat, so as to keep it pre-heated. Then in a refrigerator, also operating, keep some ice-box cookie roll, ready to be sliced off. As you begin your sales talk, slice off a few pieces of the ice box cookie roll, drop them on a cookie sheet, put them in the roaster, step up the heat to high, and go on showing the good points of the roaster with another roaster. By the time you have described all of the essential features, told the list of reasons for buying given above, the cookies will be done, taste delicious, and give you a fine opening to ask for the order and close the sale.

SHORT SALES TALKS
That hurdle Sales Resistances

NUMBER 6A — ELECTRIC ROASTERS

When the prospect says:

Prospect: **"But will it brown my roast? I've heard that all they do is sort of steam cook or stew it."**

THIS objection is fairly common and harks back to earlier models of cookers and roasters in which searing of a roast was not always possible. But higher wattages, better design, have cured this difficulty. Notice how Bill Smith, really successful salesman, avoids argument yet does meet the objection, overcomes it, and asks for the order.

BILLS "Brown a roast? I don't wonder that you want to be sure on this point, for a roast just isn't a roast if it isn't nicely browned, is it? What you heard doubtless was about some of the older models, but great improvements have been made in the design of these remarkable roasters in the last year or so. Now you can cook nearly anything in one of these roasters that can be cooked on a range. They are especially good at giving roasts just the right brownness and deliciousness. The same flavor saving quality, the same preservation of healthful juice and mineral salts that you get in a modern electric range you also receive with this roaster. Besides an excellent cooking device, think how nice it is to be able to take it anywhere—to the beach or mountains—on picnics—keeping foods hot and appetizing for several hours. In summer it is ideal either to cook or keep foods cool for it keeps heat out just as effectively as it keeps heat in. It is attractive enough to take right to the table, easy to keep clean and will save you time, thought, and lots of effort. Why not let me send you this model here and you can enjoy your outing this week end as you never would believe possible. Shall I send it out to your home?"

When the prospect says:

Prospect: **"They cost a good deal, don't they? I couldn't afford one just yet, although I will say they are nice to have."**

THIS is the familiar price obstacle. In whatever way it is said, it is sure to appear. Sometimes it is genuine, but most often it is thrown into a sale to see whether the salesman will back down. You can't exactly blame a customer for testing you to see whether the price you ask is really bottom or just a starting place. Weak salesmanship starts retreating when the price obstacle comes forth. But a salesman who knows the wealth of services that the customer can obtain from his appliance, as Bill Smith does, has no need to back away. He can make the price look cheap compared to the advantages. Try this technique:

BILL: "Cost a good deal? I can understand it might seem so if one didn't know how remarkably useful and versatile these roasters are. Let me show you a few of the ways in which it will truly earn you more than its cost. First it cooks so deliciously—keeping all the real flavor, the juices and rich appetizing aroma. It cooks in practically every way possible—baking, boiling, roasting, stewing, frying, and

even broiling with the newest attachments. There are a hundred different uses, from canning vegetables and fruits to heating water in emergencies. And believe it or not, it will keep things cold for hours just as well as it keeps them hot. Yet it is cool to cook with—an ideal thing in summer. And it is easily taken with you on a picnic—or to the country or beach. It will even cook while you are off swimming or downtown shopping. For it is fitted with automatic features that do the pot watching for you. When you consider all the services that this attractive and economical roaster will perform for you why not take advantage of them? You would like to have this maid-of-all-trades, wouldn't you?"

★★★ If fads mean anything to selling—and they do—this year should see the biggest boom on electrical roasters that has ever been experienced. And that should mean plenty of sales and profit to any dealer or salesman who goes after this popular business. Last year laid a wonderful groundwork for you. There are now thousands of satisfied customers who are advertising for you in a potent way,—by word of mouth. Sales resistances are very few. Buying advantages are so numerous that it would be hard to include them all in talking with any single customer. No appliance has the versatility of a modern automatically controlled electric roaster. There is a real opportunity to sell many more this year than you did last. Use the sales points of this Sales Guide as Bill Smith, the successful salesman, does to meet any objections or resistances that are brought forth. Select the special advantages a roaster possesses to answer any particular need expressed by a prospect. You will be more successful if you fit the appliance to the job your prospect needs to have done.

When the prospect says:

Prospect: **I have a new range and a fine oven. I really do not need a roaster."**

NOT realizing that the roaster offers so many additional uses many women feel that they cannot justify purchasing one just to duplicate their oven in baking and roasting. Most such prospects are surprised to find how versatile a roaster is and how, though it does roast and bake excellently, it is not meant to take the place of the range except in unusual or emergency cases. In correcting this impression, Bill Smith reviews for this prospect a number of other reasons for owning one.

BILL: "You have a new range? That is really fortunate, for you know from experience how much better food tastes cooked in a modern oven. The roaster cooks with just the same principles and gets just as fine results. I wouldn't suggest your getting a new roaster to take the place of your oven, by any means, except in case you had a house full of company and needed an extra oven to help out. Or in case your oven was in use cooking something, say, that took a low temperature, while you wanted to cook something that needed a high temperature, like biscuits for example. Then the roaster would prove a wonderfully useful auxiliary oven. But what is so satisfactory about owning one of these modern roasters is that it does so many other things for you. It is useful in sickness—serving warm meals to those who are ill, making soups that take so long to cook slowly, keeping hot applications hot, or cold compacts cold. To take warm food out with you on a picnic or to a church social it is ideal. It is attractive and can be used to serve from right at the table. An attachment converts it into a buffet server to keep two deep containers of food at just the right serving temperature. A roaster makes excellent doughnuts or French fried potatoes or other deep frying for it never lets the grease burn or scorch. After understanding in how many ways this roaster can add to your comfort and make it easier for you to entertain gracefully I'm sure you'll want to have it. May I send it out to you?"

WHILE in these short talks Bill mobilizes all the sales points that apply to the obstable or resistance that has been offered, in actual experience the telling all of them might be interrupted several times and thus spread through a number of answers to new questions raised. But when a doubt is expressed the good salesman will make sure that he assembles enough evidence to satisfy his prospect completely, then ask for the order and the sale is made. It is cheaper to sell the article well ONCE than to waste time and effort RESELLING and satisfying a customer.

CALIFORNIA OREGON POWER CO. · PORTLAND GENERAL ELECTRIC CO.
MOUNTAIN STATES POWER CO. · PUGET SOUND POWER & LIGHT CO.
PACIFIC POWER & LIGHT CO. · IDAHO POWER CO.
NORTHWESTERN ELECTRIC CO. · WASHINGTON WATER POWER CO.
UTAH POWER & LIGHT CO.

DISPLAY IDEAS for ROASTERS

●

● Best of all displays is a live demonstration going on constantly in the store in a conspicuous place. For this purpose counters made up like those at the left are ideal. They are simple and effective.

● The main counter is about 24 in. wide and 8 or more feet long, with two shelves under the table-high top. The shelves should be spaced so that roasters with covers on can be placed on both levels.

● The bottom shelf is better raised from the floor about 3 in. for a kick space. This prevents scuffing of the display table, enables prospects to get right up close with comfort.

● A backing to the shelves, dividing them vertically, but far enough back to provide ample room in front for the roaster, allows you to keep literature, wrapping materials, cooking utensils and supplies on the rear part of the shelf out of sight.

● Lumiline lamps mounted on the underside of the shelves keeps the appliances displayed on such tables brightly lighted and attractive.

● A chromium plated pipe makes a neat support for the center of the shelves and gives a modern touch.

● Cream or white, with blue or metal trim are good finish colors. They allow the merchandise to take the center of attention, as you want it to, yet set it off with a contrasting neutral background.

● Quarter- or semi-circular end counters can be made up in the same fashion, as shown at the left.

●

● Window displays of roasters usually look better when you mass several roasters than when you make a single display, unless you arrange to dramatize the single roaster with spectacular effects that draw all attention down to the single model on exhibit. In making a mass display of roasters it is best to concentrate on one idea, however. If it is near some holiday tie in to that. If you advocate roasters for picnics, concentrate the window on that one idea.

● Remember most people passing by only have three seconds with which to catch the idea you are trying to have them carry home and think about. The picture at left illustrates one good way to carry the eye down from normal eye level to the floor-of-the-window level. Starting with a series of steps (made of cartons of various sizes with some neutral cloth or corrugated paper covering), the eye is made to follow down with them to the lowest roaster, tilted a little so that its interior may better be seen, and to a sales message on a card in the lower corner of the window.

● Other similar ideas may be experimented with. Watch the crowds passing by to get the prevailing trend of travel and plan your display to take advantage of it.

● Remember, lots of people drive by at night. Light the display brilliantly so that your window can make its impression on them, too.

Others . . have found these ideas sell

●

RECIPE leaflets or booklets, sent through the mails or distributed to floor prospects have been successful in bringing customers back.

●

FOREIGN food specialties featured occasionally give variety and enable you to advertise them as an incentive to come to the store.

●

VACATION hints make a good tie-in with roaster demonstrations. How to cook during vacation so as to have more time for play and rest will attract many a tired mother who looks forward to vacation with misgivings of it being a time when she must cook more meals for more people and without any of her customary home conveniences—unless she takes a roaster.

●

WORKING WOMEN can be given a special night or Saturday afternoon demonstration to show how they may prepare meals for husbands or children with least effort and have it done when they themselves come home tired from work. There is also a big market among working girls who must save pennies by preparing their own meals.

●

FEATURE the roaster as a sick room aid. Show how meals may be served warm to sick children or invalids. Demonstrate its use in sterilizing dishes, sick room supplies. Show how it can keep hot compacts hot, or ice packs cold. Show its use to vaporize inhalants.

●

FREE luncheon, prepared completely in roasters, costs very little and brings many good prospects. Either buffet style or a full meal, this stunt is used to good advantage by a large number of dealers and utilities.

●

MAIL ORDER offers can be used to advantage by any dealer who circularizes his former customers with a letter and literature offering to send a roaster by mail or express. The acceptance of these roasters has been so well developed that a definite offer sometimes is all that is needed to cause prospects to decide.

●

RANGE SALESMEN should carry a roaster in their cars. Failing to close a range sale they can often sell a roaster.

● Paste the colored illustrations and articles on roasters appearing so frequently in the women's magazines either on an easel card or directly on the window. These have a way of saying to the passerby—"You saw this in your magazine at home, and here it is, in person." In fact, it is a good idea to print just such an idea on the display card or window. Take advantage of all such "breaks" to steer buyers into your store. These magazines help to creat the desire to own—you tell them where to buy. *(from McCalls)*

COMMITTEE REPORTS

Northwest Electric Light and Power Association

1936-37

Table of Contents

Business Development Section

Introductory Statement 86
"A Welcome and An Inventory of Our Line of Goods" by George M. Gadsby 87
"Response to Address of Welcome," W. C. Mainwaring 88
"Do Not Anchor Here," by Davis M. DeBard 88
"Challenge to Commercial Departments from Federal Development of Power," by George C. Tenney 90
"Public Relations Responsibility of Commercial Departments," by E. H. Adams 91
"A United Front on Sales," by Dr. Adam S. Bennion 92

Residential Sales Bureau

Introductory Statement 93
Report of Home Modernization Committee, by G. W. Madison ... 93
"Trial Plan of Installation to Promote Range and Water Heater Sales," by F. J. McAllister 95
"The Utility Attitude Toward the Promotion of Socket Appliances," by F. M. Ingraham 95
Report of Home Service Committee, by Nancy Finch 96
"How to Handle a Trouble Call on a Range," by Audrey Herrington 97
"What Customers Want to Know," by Audrey Herrington 97
"Arranging, Getting Attendance and Planning for Group User Classes," by Beth Fillmore 98
"Making Certain that Small Appliances Are Used," by Estella Dorgan 98
"Planning Radio Programs That Sell," by Edith Rauch 99
"Selling the All-Electric Kitchen," by Ardell Welch 99
"Home Lighting Progress and Forecast," by Walter E. Potter 100

Advertising Committee

Report of, by J. Lightbody 102
"Selling Better Light—Better Sight," by Walter E. Potter 103
"Rural Electrification Advertising," by Harvey Leach 104

Commercial and Industrial Sales Bureau

Introductory Statement 105
Report of Industrial Power and Heating Committee, by George L. Ellerbeck 105
"Central Station Electric Service in Utah Copper Company," by J. A. Hale 107
Report of Commercial Cooking Committee, by C. T. Bakeman 108
Report of Commercial and Industrial Lighting Committee, by G. B. Bocarde 110
"The Utility Lighting Sales Organization," by J. Homer Shaw .. 111
"Street and Highway Lighting for Safety," by C. T. Bakeman 112
"Some Aspects of Air Conditioning," by J. E. Yates 113

Rural Sales Bureau

Report of, by S. J. Bowman 114
"The Rural Line Built—The Job Just Started," by J. C. Scott 115
"Making Acquaintances and Securing Prospects," by Ben W. Faber 116
"Farm Equipment Dealer Cooperation," by W. R. Newmyer 117
"The Place of the Farm Magazine, Newspaper and Direct Mail Advertising in the Promotion of Rural Electrification," by Eugene C. Schuh 117
"New Electric Farm Equipment," by Eugene C. Schuh 118
"Building the Farm Lighting Load," by Walter E. Potter 119
"Practices in Promoting and Recording Rural Business," by K. W. Browning 120

Engineering and Operation Section

Introductory Statement 121
"Relationship Between Commercial and Engineering Departments," by W. C. Mainwaring 122
"Some Developments in Utility Engineering Nationally," by J. O'R. Coleman 123

Power Systems Engineering Committee

"Stability Studies Permit Increased Power Flow," by C. E. Cannon 124
Oral Discussion 126
"Carrier Current Communication Over Distribution Circuits," by J. D. Hertz 126

Power Production Committee

"Electrical Features of the Bonneville Project," by L. E. Kurtichanof 127
Round Table Discussion of Hydraulic Governors 128
"Isolated Plants for Small Towns," by C. P. Eliot 129
"Increasing the Capacity of the Northwest's Largest Boiler," by Russell F. Miller 129
"Methods of Protection Against Oil Fires," by O. L. LeFever 130
"Economics of Industrial Power Plants," by A. H. Greisser 132

Codes Committee

"N. E. C. A. Revisions as They Affect the Utility," by M. T. Crawford 133
"New Types of Wiring Assemblies," by S. B. Clark 134
Oral Discussion 134

Utilization Committee

Introductory Statement 135
"Meter Developments and Improvements," by Reno Thatcher 136
"Electrical Heating of Residences," by H. V. Carpenter 137
"Kitchen Design—An Aid to Loadbuilding," by Walter Brenton ... 138
"Recent Developments in Utilization of Electric Service," by Corbett McLean 138

Accident Prevention Committee

"Causes of Accidents Among Commercial Fleet Operators," by R. S. Maxwell 139
Oral Discussion 140
"1936 Personal Accident Experience of Member Companies," by J. D. Ellis 140
Oral Discussion 141
"Status of Electric Farm Fences in Oregon," by R. J. Davidson .. 141
"Eye Examinations for Industrial Workers," by Dr. Richard F. Berg 142

Transmission and Distribution Committee

"Recent Developments in Transmission and Distribution Apparatus," by John Bankus 142
Oral Discussion 147
"Protection of Equipment from Over Voltages," by H. L. Melvin .. 147
Oral Discussion 148
"Development of Low-Cost Distribution Systems in Northwest," by R. J. Davidson 148
Oral Discussion 148
"Distribution Transformer Loading," by S. H. Ferguson 148
Oral Discussion 148

Business Development Section*

Introductory Statement

GEORGE H. WISTING

THE section was organized and the foundation laid for the annual meeting at a meeting of the Advisory Executive Council in Portland, Sept. 25, 1936. The customary three Bureaus—Residential Sales, Commercial and Industrial Sales and Rural Sales—were set up with suggested committees under each, and, in addition, one committee-at-large on advertising.

Plans were laid for the program of the annual meeting and the place and date of the meeting were set at Salt Lake City, Utah, Mar. 25-27, 1937. At the same time a second annual conference on commercial cooking was authorized.

The Commercial Cooking Conference was held at the Hungerford Hotel, Seattle, Nov. 19-21, 1936. It was attended by 41 delegates from 11 utility companies and seven manufacturing companies and distributors. Four half-day sessions of discussion were held, two of which were given over to the manufacturers and distributors to show and demonstrate new equipment in their respective lines. Saturday morning, Nov. 21, was devoted to inspection of electric cooking installations in Seattle. The minutes of the meeting were mimeographed and distributed to those attending the conference and to member companies.

The twelfth annual meeting of the section was held at the Hotel Utah, Salt Lake City, Mar. 25-27, 1937. The meeting was attended by 321 registered delegates, of which 186 were from outside the city of Salt Lake.

The meeting opened with a general session Thursday morning, Mar. 25, presided over by George H. Wisting, Northwestern Electric Co., section chairman. In his opening remarks Mr. Wisting referred to the convention of the association held in Salt Lake City ten years ago, recalling some of the prophecies made by speakers at that convention, and stated that in the course of the speeches and reports to be heard at the present meeting, we would see what the results had been in the past decade. In this session addresses were heard by George M. Gadsby, Utah Power & Light Co., president of the association; W. C. Mainwaring, B. C. Electric Railway Co., vice president of the association; Davis M. DeBard, Stone & Webster Service Corp. and chairman of the Sales Committee, Edison Electric Institute; George C. Tenney, editor, ELECTRICAL WEST; and E. H. Adams, B. C. Electric Railway Co., president of the Canadian Electrical Association. Abstracts of these addresses are printed herein.

On Thursday afternoon, Mar. 25, separate committee conferences were held concurrently as follows: Commercial Cooking and Air Conditioning; Industrial and Highway Lighting; Home Service and Domestic Lighting; Home Modernization; Advertising; and Rural Sales. Friday morning, Mar. 26, was also given over to committee conferences as follows: Industrial and Commercial Power and Heating; Commercial Lighting; Home Service; Home Modernization; Advertising; and Rural Sales.

On Friday afternoon, the meeting again assembled in general session when reports were heard from the committees of the Residential Sales Bureau, presided over by W. A. Huckins, Utah Power & Light Co., chairman; and the Advertising Committee, J. Lightbody, B. C. Electric Railway Co., chairman.

Beside the committee reports in the program of the Residential Sales Bureau, there were two talks on related subjects. C. P. Keenan, Detroit Edison Co., told of the policies adopted and methods used in selling ranges and water heaters by his company. K. M. Robinson, Idaho Power Co., chairman of the Water Heating Committee, Edison Electric Institute, discussed the progress of the water heating movement nationally, bringing out reasons why the off-peak water heating load was a good load from the utility company standpoint. These two talks were not prepared for publication.

Saturday morning, Mar. 27, the final general session was held during which reports were heard from the committees of the Commercial and Industrial Sales Bureau with A. K. Gaylord, Portland General Electric Co., chairman, presiding; and the Rural Sales Bureau, S. J. Bowman, B. C. Electric Railway Co., chairman. This final session closed with an address by Dr. Adam S. Bennion, Utah Power & Light Co., an abstract of which is printed herein.

On Saturday afternoon the delegates were offered a trip to the Utah Copper Co. mine at Bingham Canyon and the flotation plant at Magna. A sight seeing trip around Salt Lake was also offered.

In the following pages are printed summary reports of the committees bringing out subjects discussed during the committee conferences and also abstracts of some of the papers presented by individuals at those conferences. Preceding these are abstracts of the addresses by Messrs. Gadsby, Mainwaring, DeBard, Tenney, Adams and Bennion.

---

* Advisory Executive Council: George H. Wisting, Northwestern Electric Co., Chairman; R. E. Gale, Idaho Power Co., Vice-Chairman; Chairman, Industrial and Commercial Sales Bureau, A. K. Gaylord, Portland General Electric Co.; Chairman, Residential Sales Bureau, W. A. Huckins, Utah Power & Light Co.; Chairman, Rural Sales Bureau, S. J. Bowman, B. C. Electric Railway Co.
B. C. Electric Railway Co.: W. C. Mainwaring; The California Oregon Power Co.: Glenn L. Jackson.
The Montana Power Co.: I. L. Comstock.
Pacific Power & Light Co.: D. B. Leonard.
Portland General Electric Co.: A. C. McMicken.
Puget Sound Power & Light Co.: Patrick Johnson.
Utah Power & Light Co.: P. M. Parry.
The Washington Water Power Co.: L. A. Lewis

An Inventory of Our Line*

By GEORGE M. GADSBY
Utah Power & Light Co.

ELECTRIC utility service means more than the delivery of electric energy to a meter. For the supplying of adequate reliable service the small isolated plant gave place thirty years ago, first to a central station of capacity sufficient to promote efficiency of production, and later to the interconnected system drawing its power supply from diverse plants capable of utilizing either hydro power or steam generation at constantly lowering cost. A return to the small isolated plant for general utility service is technically a long step backwards. Even the larger cities have found difficulty in maintaining under adverse circumstances satisfactory service from their own plants. During the past year press notices have appeared of serious service interruptions in Cleveland, Ohio. Tacoma a few years ago was saved only by the intervention of the U. S. Navy. Los Angeles has purchased a very large proportion of its electricity from a private company and later sought and obtained the support of the Federal government in the construction of Boulder Dam and the transmission lines connecting it with Los Angeles, which will give it the outside support of a great development paid for by the taxpayers of the entire country. Experience must yet demonstrate whether the hazard in the long transmission lines will provide a continuous service without steam reserve in tidewater plants.

The small municipal plants supply electric service which falls far short of being the 1937 version of electric service.

Complete electric service now consists of four steps: (1) Manufacture; (2) Delivery; (3) Sales and (4) Service.

A complete job requires under manufacture, an abundant supply of energy with ample emergency reserve capacity so that it may always be available under full voltage and of uniform frequency. Voltage and frequency regulation from a small plant is practically impossible.

Under delivery, adequate service requires sectionalized transmission and distribution systems protected by automatic switching and protective equipment. In former days the town light plant justified its requirements if it furnished sufficient energy to keep the lights going from dusk to dawn; daytime interruptions were not serious. Today that situation has changed, and a full 24-hour service is necessary with hazards reduced to a minimum by breaking transmission and distribution circuits into sections so that when accidents do occur in one place, only a small area is affected.

Under sales, is included energetic commercial development with a trained and experienced personnel cooperating with local dealers. The best plant in the world delivering a full supply of electricity would never have brought about electrification on the present-day scale. Except for intensive sales work electric energy would still be used exclusively for lighting through a carbon filament lamp at 18c to 20c a kw.-hr. The private companies alone are responsible for the development and sale of appliances and utilization equipment whose widespread use have made possible the lowering of rates and bringing to the home and farm the manifold conveniences and labor-saving devices supplied with electricity. This work is continuous and is evident among other things in the advertising conducted, with but few exceptions, only by the private companies. This advertising includes the newspapers, radio, sign boards, window displays, literature, etc.

The service rendered in securing extensive and efficient use of electricity is an all-important part of the complete electric job and again is to be found almost solely among the utility companies. We consider our job but started with the delivery of the energy to the consumer's meter, at which point the municipal plant stops. The utility companies maintain service departments in the larger places on duty 24 hours a day, largely at no cost to the consumer.

Appliances are kept in working condition.

Plans and estimates are furnished for kitchen modernization.

Pressure water systems are brought to the farm.

Stoker equipment is advertised and displayed in cooperation with dealers.

Better Light-Better Sight campaign of the past three years conducted by scientifically trained employees is literally a boon to mankind.

Home service departments with trained home economists are available on call.

Cooking schools are conducted both in the larger towns and by portable equipment in the rural areas.

Model homes are built, equipped with the most advanced ideas and made available to all patrons.

Included in the commercial departments of the larger companies are men experienced in air conditioning and industrial plant equipment. These men are kept up-to-date through frequent attendance at conferences, schools, and factories, and their services are available to the commercial and industrial user on call. The utility company does not sell the equipment required, but aids the user in suggesting the type best adapted to his needs.

Arguing about the power situation in the Northwest are (seated, left to right) W. A. Huckins, general commercial manager, Utah Power & Light Co.; George H. Wisting, section chairman, and George C. Tenney, editor, Electrical West. Standing are James Lightbody, advertising manager, B. C. Electric Railway Co., and Asa Gaylond, Portland General Electric Co.

* An abstract.

Air conditioned auditoriums are being provided in the larger communities.

Accident prevention and safety work are a regular part of employee training and in constantly recurring cases are of life-saving value to the public as well as employees.

Cooperative work with the schools in domestic science and practical engineering is continuously conducted.

Summer employment of students from the universities desiring engineering training is offered to the fullest possible extent.

Training courses for employees are conducted every year.

Christmas lighting is frequently furnished without charge for current or planning work in the displays.

Civic, charitable, and promotional activities of the communities served are supported financially and by the membership of the employees.

The citizenship of the utility companies is based upon a permanency and a constructive interest in every hamlet, town and city supplied from their lines.

Response to Welcome

By W. C. MAINWARING
B. C. Electric Railway Co.

OUR president has clearly outlined the necessity for selling our services and I feel confident has brought home to all of us the great responsibility that rests on the shoulders of commercial executives and sales people in the utility business today. We are on the eve of the greatest development our industry or any other industry has ever known and the success we attain is entirely dependent on the thoroughness with which we plan every activity, whether it be connected with the sale of service or merchandise. New and improved appliances plus increased earning power will double and treble domestic appliance sales and load and we must be constantly alert to take advantage of every consumer contact to make sure we are securing the ultimate in business returns from it. The opportunity of a century is here now, not tomorrow, not next week or next year, and it becomes an individual responsibility with each of us as to how successful our respective companies are going to be.

The pioneering work of the last twenty years in creating public acceptance of electric service in the fullest sense is now bearing fruit. The stage is set; we are the actors. Let us live up to the highest ideals of our industry and make sure that each of us plays his part in a way that will reflect the greatest credit on electrical service, which is the greatest boon humanity has ever received.

* An abstract.

Do Not Anchor Here*

By DAVIS M. DE BARD
Stone & Webster Service Corp.

I WANT to hang up a word of warning: "DO NOT ANCHOR HERE." You of the Northwest Electric Power & Light Association have done a good job. You are still doing it. You have installed efficient generating equipment. You have extended your distribution systems. You are constantly improving your service. You have reduced rates. You are striving to create public confidence. You may well feel proud of the results of your efforts. And I congratulate you. But I must also warn you: *Do Not Anchor Here.*

One of the dangers that confronts us is in a feeling of satisfaction in our accomplishments, coupled with an insufficient effort to make the public fully cognizant of all that we actually have done, and all that we are prepared to do in the future. There is such a tremendous need for public understanding; there is so much room for growth in our industry; there are so many new forms of service that we can offer; there are so many new serviceable appliances which haven't yet been sold; that I, for one, believe the industry could double its output in less than a decade if the proper effort were put behind it. But we cannot expect the public to be fair and just in their appraisal of our efforts unless we place our electric companies and their aims and accomplishments properly on public display.

The industry has been making steady progress in its technical and operating departments: in the topper turbine and other devices for increasing thermal efficiencies that have retarded obsolescence; in improved efficiencies built into new construction both in steam and in hydro-electric plants; and in many other technical improvements that have been made to increase net earnings. All of you are awake to the technical improvements that are available; most of you have adopted them. But I do find many companies unaware of the "Don't Anchor" sign off to starboard when we come to the question of sales campaigns to promote greater use of electrical power. Sell the USE, gentlemen. Sell the U.S.E. Utilities sell energy.

In reply you will probably point to last year's record and say that according to E.E.I. statistics, all classes of customers purchased 15.3 per cent more kw.-hr. than they did in 1935; that the average customer income increased to $33.72 per year; that we sold the public electrical appliances and supplies to a total of $535,000,000. This is true but I repeat that we should not for one moment feel satisfied. There are those managements who feel that when business is good they can stop research, cut down advertising, decrease the number of salesmen and curtail new business expenses. But this is costly policy. Promotion, when accelerated, must be kept going if it is to be efficient and effective. The automobile advertisements are right when they say: "It costs money to stop and start."

Next let's talk about selling. Take the "Better Light-Better Sight" campaign for example. Have you ever used this eye-preserver and load builder as you should? I'll wager that you won't find I.E.S. lamps in 25 per cent of the homes of your customers. I'll go farther and say that not one out of three children in your grade schools has in school or at home as much as ten foot-candles for reading and study. The national campaign is endeavoring to make the public light-conscious, but also the equipment necessary to give the public proper light must be sold.

This is just one example of a movement sponsored by the executives of an industry, fostered by the operating companies and by the manufacturers of equipment, merchandised to the dealers and sold to the employees. It should result not only in a great human service to both young and old in preserving eyesight, but also in more load to our companies, if we all stay behind it and keep everlastingly pushing as hard as we can to promote the campaign now so satisfactorily under way.

The Department of Commerce tells us that between four and five hundred thou-

* An abstract.

sand new homes will be constructed in the United States this year. What are you going to do to get your fair share of this load? Our kitchen modernization program gives us an excellent start. The complete kitchen shown in national advertising, talked about over the radio, displayed in stores and model homes is worthy of your attention. Many companies are spending a large share of their advertising appropriations to capture this market.

Modernizing Old Homes

Next, and equally important, is the old home market. There is still ample opportunity to sell greater use of electricity in the millions of homes already in existence. The refrigerator market is by no means saturated. Great improvements have been made in the electric range. Water heating is being sold extensively by enterprising companies wherever off-peak or low follow-on rates have been established. Installations on, say, from 2 to 5 per cent of your existing meters would not be too much to expect in the next year and would add tremendously to your load.

One excellent way to start this water heating business has been tried in Europe with great success. There, water is heated at the point of use, the heat being regulated to give the proper temperature for each use: 150 deg. at the kitchen sink, 115 deg. at the wash bowl and 125 deg. at the bathtub. I am told that companies abroad have sold two, three, four and five-gallon non-pressure electric water heaters with 1,000-watt elements, thermostatically controlled, literally by the thousand. Actually, 48,000 of these heaters were sold in Great Britain during the last twelve months. Here is a unit that uses 500 to 700 kw-hr. per year—almost twice as much as a refrigerator—economical to construct and we have paid it no attention.

The gas industry is awake to the possibilities of this type of load. They already have a small kitchen sink water heater similar to those used for gas in Europe, for which they are finding a ready market. One gas company sold these units to 7 per cent of its customers in six months. The educational value of the little heater increased sales of large heaters 87 per cent during the following year.

Profit at the Bottom

Next, and perhaps most important of all, let me call your attention to one historic fact. The electrical industry has developed from the top down. By that I mean its first customers were in the high income brackets. I want to convey to you the importance of developing the low-income market. All I need to do, I think, to show you how valuable it is, is to call your attention to your own rate schedules and from them produce the fact that the earnings from the sale of one kw.-hr. to a customer in the low-use group is equal to the sale of 5 kw.-hr. to a customer in the higher income brackets. The real profit that you can make lies in the development of greater use in the vastly greater number of low-income homes.

That brings us to the problem of selling appliances where the customer cannot afford to pay for the appliance in one lump sum. To overcome this I know one company that has had specialty men working on low-income customers using less than 400 kw.-hr. per year. They report that during the last few years they have been able to increase the use in the homes of approximately half of these customers to an average of 535 kw.-hr. and that the installment collection record in this group is better than that in the higher income groups.

Time Payment Schemes

The problem of financing appliances has been the subject of discussion for a number of years. Many companies have developed plans in collaboration with finance companies, or with local banks, which relieve them of a portion of the credit responsibility. I have always believed that we should endeavor to keep the manufacturer on a cash basis; that the dealer and utilities should be responsible for promoting, selling and collecting; that the bank or finance company should bear the major portion of financial risk. Due to the excellent record of installment payments over the years I believe this can be done profitably by the banks and finance companies at a reasonable rate.

Visualize the Wiring

There is one thing of which we must be careful when we start out to sell more and more appliances to our customers. Not enough thought has been given to it in the past and I earnestly suggest that you give it more consideration in the future. That is inadequate wiring. Each of us understands the problems that it creates. All that the customer may be aware of is unsatisfactory operation of the appliances. What we need is some type of gadget that can be used to demonstrate readily to the customer that his wiring is inadequate. There has been proposed a small power meter which will register the voltage at the entrance of the house and then show the drop in voltage dramatically as various appliances are connected in the circuit. Some kind of a gadget would undoubtedly help tremendously just as the sight meter has helped in the "Better Light-Better Sight" campaign. The words "Adequate Wiring" should be placed in a frame and hung over every sales manager's desk so that he will be constantly reminded that plans for more wiring are needed.

Rural Extension

There is another profitable channel in which we cannot afford to anchor. We are faced with the problem of continually making very expensive extensions into rural territory. As these are built it behooves us to use every possible means of increasing profitable load on these lines. Many plans are being tried, some of them with marked success. But a vast amount of educational work will have to be done before farm lines really can be made to pay. One valuable thing that *can* be done is to train our men to "speak the farmers' language." We must develop data for the farm as we have for industry. For instance, what farmer would not be interested in a milking machine if he were told that the average cost of current for milking a cow is 27c a year? What farmer would not be interested in a water pump if he knew that water could be delivered to any place in his home from his own 1000 gallon tank at a cost of only a few cents per barrel? Such data are essential to the rural salesmen. I urge you not to stop in the sale of electricity for lighting, but to sell the farmer all of the benefits that your service holds in store for him.

Keep at It

I could go on calling your attention to more of the many ways open to us for increasing our load and improving net earnings. Each of them has, as have the ones I have mentioned to you in these few minutes, something more than just the idea of dollar profits. As we sell the USE, we sell the convenience, the comfort, the benefits of our service. Therefore we enhance the need for ourselves as the servant. And, if, at the same time we develop, through proper advertising, promotion and publicity, a thorough public understanding of our efforts and our aims, we will have gone far to insure the continuation of our existence as a private industry. But we must keep steadily at it. That is why I say to you again and again, "*Don't Anchor*".

The Challenge from Federal Power Developments*

By GEORGE C. TENNEY
Editor, Electrical West

THE WEST has been particularly blessed or cursed with federal power projects. They run the gamut from Boulder Dam in the south to Bonneville and Grand Coulee in the north and Fort Peck and Casper-Alcova in the Rockies. Each of these presents peculiar problems and subject matter for a separate discussion. Most of my remarks are going to be confined to one. But before becoming specific there are one or two general observations to be made.

One aspect of all of these projects is likely to be overlooked due to our special interest in the power phase. None of them has been primarily undertaken for power. Water conservation, flood control, irrigation or navigation, singly or jointly have been named as the primary purposes with power incidental. Irrespective of the economic justification for any of these projects, the fact that they are built or building, that they will be completed, leads me to conclude that we are overlooking certain meritorious aspects of them. If there is some good in them, let us accept it. The bad will not then seem so bad. In most instances we have refused to take cognizance of the obvious advantages offered by them, with the result that the evil in them has appeared doubly black. This has been only natural since our self-interest was with power primarily.

Here is a thought to bear in mind: The West is growing in population more than twice as fast as the rest of the nation—three times as fast as the East. People are coming from the dust bowl looking for farms. Attracted by the resources and advantages of our coast states they are coming westward seeking opportunity. If these projects will conserve water so that more arid land may be irrigated, if they remove the dangers of obvious floods, if they improve navigation, then to that degree they become assets. We should not lose sight of the fact that population means new load, new revenue and new life for the industry.

Turning now to the power phase, let us see if, in the light of recent pronouncements by the administration spokesmen, the problem of federal power development has not, chameleon-like, changed its colors. Here is a quotation from the Bonneville recommendations of the Committee of National Power Policy:

"In order to insure that the power development at Bonneville project will be carried out for the benefit of the general public, and particularly of domestic and rural consumers, the Administrator should, in disposing of electric energy, give preference and priority to public and cooperative agencies, namely to states, districts, counties and municipalities, including agencies or subdivisions thereof, and to cooperative organizations of citizens not organized or doing business for profit but primarily for the purpose of supplying electric energy to their members as nearly as possible at cost."

Let me repeat one phrase only "to public and cooperative agencies, namely states, districts, counties and municipalities . .." Does not the problem of federal power thus immediately then become a local problem? Local in the sense that small units of population—communities or districts—will be involved. In every instance new agencies must be created, bonds voted, property change ownership, tax programs revised. Favorable public opinion must be created before any of these things can be accomplished. There must be elections and valuations and condemnation proceedings.

Is the public in any frame of mind for any of these things? I do not think so. Can the private utilities forestall local agitation? My answer is "Yes." Proof of the first statement is contained in the outcome of three recent elections involving municipal distribution. In the outcome of elections in Fresno, Tulare and San Francisco, the industry can take definite reassurance that the public is ready for a partnership of confidence and understanding. The interpretation of the outcome of each of these elections would require too much time. Suffice to say, there was no formula unless it was reiteration that the mere changing of the label on the wires, substations and offices and the name of a new proprietor on the bill would not change the price or improve the quality of the kilowatt-hours used.

We seem to forget sometimes that we have a tremendous advantage over those who would displace our service with something else. Rather than use the tools at our disposal we look for mystic charms, or mysterious incantations that, like Aladdin's lamp, will work miracles. If a utility has been conscientious and sincere in its efforts to provide real service at reasonable rates, if it has been fair in its dealings with its customers and its employees, if its sales program has built load and friends at the same time, then its battle is more than half won. It is because I know that every company represented here has such a record that I am not fearful of any attempt to supersede its service with something else.

If the federal power problem is a local power problem then the challenge to the commercial men is plain. It indicates several self-evident things:

(1) Sound selling which will build load so that rates will be so low that the public will see no advantage in turning its electric service over to some other agency.

(2 Sound selling which will convince the public that the utilities and the men and women in them are good citizens, assets to the communities in which they live and above all—friends.

(3) Sound selling which will include every reasonable method and procedure to make it easy and pleasant for the public to do business with you.

(4) Sound selling which will adequately recompense the people in your own organization and permit those engaged in other branches of the industry to make a legitimate profit.

There is another responsibility for the commercial men to accept. And it may take some selling to management to permit them to undertake this job. We have been zealous in selling our service but have we been equally zealous in selling ourselves, our companies and our system of doing business? What selling have we done to create favorable public opinion? This is a task for the commercial organizations. We want a partnership of mutual understanding and confidence with the public. This partnership will come with public conviction that we are bringing them tangible benefits, not just electric service. And this is a selling job. Ask management to delegate it to you and your sales organizations.

* An abstract.

Public Relations, the Responsibility Of Commercial Departments*

By E. H. ADAMS
B. C. Electric Railway Co.

LET US approach this subject seriously and ask ourselves the question "What can we do to make people want to do business with us?" There was never a time in the history of our business which called for the exercise of greater patience and skill in the conduct of our daily affairs, beset as we are with problems of government regulation, interference and unfair competition, discriminatory taxation, and half truths and misleading statements of uninformed political aspirants, developing in the public mind antagonism toward privately owned utility enterprises. Yet our problems must be faced courageously and with a sincere attempt to cultivate public goodwill.

Business has been indicted on many counts, some of them fair and some unfair, but there is one indictment it cannot refute, namely, that it has been reluctant to do its part in directing public thought. Business men have too often remained silent while attacks have been made by politicians and theorists upon the system that has given us our present day standards. I think we have realized now the folly of turning the other cheek, and that we have a duty to our communities to reply to attacks when made upon us. We still believe our method of doing business is the best and the time for remaining silent is past.

But necessary as it is to defend ourselves against attack, public relations are also an internal matter, an operating problem, and in order to put this rather vague term "public relations" into the simplest possible language, I would ask three questions: Are our employees satisfied? Are our customers satisfied? Are our dealers satisfied?

Let us consider our position under these three headings.

The problem of public relations is not alone a problem for managements. It goes higher than that. It must concern the board of directors and those who are responsible for financial and other policies on which the structure of utility corporations has been founded. Then there must be a sincere desire on the part of the management to give satisfactory customer service under rates and conditions that can be defended on a reasonable and factual basis. As the problem of public relations starts at home with our own employees, there must be a bond of understanding between management and employee whereby the policies and ideas which have been determined upon will be carried out with enthusiasm and with regard to customer satisfaction.

The day is passing when the loyalty of employees can be taken for granted because they happen to be hired on an hourly, weekly or monthly basis. There must exist a definite and human bond of sympathy and understanding between employer and employee if we are to instill and retain in our employees, not only a deep sense of loyalty and a desire to defend the company against unfair criticism, but a sincere wish to speak in terms of praise of their employers in their own circle of friends.

In every large corporation there are people with talent and people with hobbies. How much consideration and encouragement are we giving to the organization of such talent, and in providing facilities for the development of hobbies?

Because it will illustrate what I am trying to tell you in a practical way, let me briefly outline some of the developments in my own company along these lines. We have an organization of some 3,500 people. We have a non-contributory pension scheme. We have a non-contributory death benefit scheme. We have made loans to our employees aggregating several hundred thousand dollars to enable them to build or buy their own homes. Every employee receives free transportation on our street railway system. Every employee who is the sole support of his family pays a nominal rate for lighting and reduced rates for gas. In case of sickness or distress cash advances are made to relieve financial worries. In every department wages are generally higher than in most other businesses, taking into account the regularity and permanance of employment.

For those reasons the staff turnover is comparatively small, and opportunities to enter the service are sought after. But because of that fact, the matter of employee interest is not allowed to end there.

Enterprising members of the staff with gifts of leadership and direction have been encouraged to organize group activities in which they are particularly interested. There is the Amateur Gardeners' Association, whose members are mostly of modest means, and who annually put on a flower show of their own products that attracts 25,000 people to our main appliance showroom in which it is held. There is a public speaking class conducted by one of our own staff, through which many of our men and girls have developed the art of public speaking. There is a very creditable dramatic society. There is a male voice choir with members from every department of the company. There is a company brass band which has won first place for local bands in annual competition. There are many other activities.

The point to be emphasized is this—that in every phase of employee activity there must be some executive interest to lend encouragement to the idea. In this way a feeling of *esprit de corps* is built up, which in turn develops a feeling of loyalty and devotion.

How much are we spending in each of our communities annually in advertising to create and extend public goodwill? You know the answer. How much are we spending in time and effort to create and develop a feeling of loyalty and enthusiasm amongst our employees, through which in turn public goodwill can be created? Any money or time spent in cultivating employee goodwill along the lines I have mentioned pays good dividends.

As to the satisfied customer, you gentlemen of the promotion department have a great responsibility. I hardly need to repeat what has been said many times before—that the high consumption customer is the most satisfied one, and one of our greatest problems today is the low-use customer. While it is true many of these are forced into that position by circumstances, that is because they are in the lowest income brackets; at the same time it is obvious that many of them use little current because they do not value our service sufficiently. If they did, they would use more. Therefore we can assume that there is a large body of our customers who do not think well enough of our service to use it in the quantity that we know it warrants.

Take, for example, the farmer. How much is his use of electric service affected by his attitude to the power company, and how much better are our relations with the farmer who uses plenty of electric service than the man who uses none at all?

* An abstract.

The question of rates must always be considered, particularly the form of rates, and must be considered from the customer's point of view. It is all very well to have scientifically accurate rates, but our rates should be as simple as possible and be easily understood.

I believe that a good job of selling our service is one of the best ways to promote good public relations, because by that means the public will accept us for what we are—namely, purveyors of a service that is well worth the price we charge for it.

Merchandise sales must be backed up with sincere and efficient service. Necessary as it is at times to combat those who attack us, we should never forget that the more we sell our service the more we establish ourselves as a commercial institution in the business of selling our wares as so many other companies do. This entails its own responsibilities, however, and it is most essential that every time we contact a customer about his waterheater, electric range, radio, electric incubator or about his lighting, whether it is in the home or in business, we must see that every chance of irritation is removed.

The third factor in our public relations problem is the dealer, and it is essential that he should be satisfied. The customer may be passively critical of the company, but when a dealer's livelihood is affected he is seldom passive. He is either a valuable friend or a dangerous enemy.

Looking at it strictly as a business proposition concerning the revenue of a company, of course we realize the importance of fostering aggressive dealers to promote the sale of current-consuming devices. They indirectly make these customers I have been mentioning, and they also have the effect of putting the sale of electrical appliances and their uses on a straight commercial basis so that people will less likely condemn their sale as the moves of a big public utility corporation.

Equally important, it seems to me, is the friendship of the electrical dealer, and for that matter the electrical contractor. Valuable as it is to have one's employees actively standing up for their company, it is still more valuable to have electrical dealers and the industry generally engaged as ambassadors on our behalf to the public they come in contact with.

The establishment of fair dealer relations is just another instance of the attitude a company has towards the public. Fairness in our relations with the public, employee and dealer go hand in hand, and with a management thoroughly imbued with the importance of this attitude it only requires that it be carried out to the letter by those in whose hands our various operations are entrusted.

There is one other phase of our business which I would like to mention, namely our purchases. We can never afford to make enemies, particularly among the business men of our communities, and therefore an announced policy of making local purchases whenever possible always pays dividends.

This is a convention of the Business Development Section of the association. You are engaged very largely in the commercial side of your companies, and at the present time that is probably the most important branch of our industry. I even hope the day may come when we shall be considered merely in the light of the service we dispense, and cease to be a center of political movements. Until that day dawns no one in the public utility industry—whether he is in the commercial department, the engineering department, or any other department of a company—can overlook the necessity for conserving good public relations.

A United Front on Sales*

By DR. ADAM S. BENNION
Utah Power & Light Co.

SALES are the life-blood of industry. Selling makes the world go round. There's romance in selling. It keeps labor busy in the factories. It keeps money in circulation. It brings unique pleasure to the buyer.

What the last quarter of a century has done in the electrical business! Four major appliances have revolutionized the domestic use of electricity: the refrigerator, the range, the water heater, the sight meter. Really, in the last dozen years the refrigerator has come into its own until now roughly nine millon are in use. The range has established itself until roughly a million and a half are now in use. The water heater, after some early experimenting, is finally on its way to public acceptance. It is estimated that some 250,000 are now in use. The sight meter has fairly revolutionized the response of homes to adequate lighting. The last three years have seen tremendous strides forward. But the work of the last few years is only the beginning. Twenty-two million wired homes provide a market infinitely rich in its possibilities. The fact that the job can be done is borne out in the statistics relative to the use of automobiles and radios. Both of these agencies may be more conspicuous, and therefore more readily salable than our appliances, but the fact that twenty-four million automobiles can be sold and that more than twenty-seven million radios are now in use—both of these realities should indicate what we can do in our field.

There is a challenge in that record—a challenge which leads us back to our theme "A United Front on Sales." When we are really drawn up for that job, we shall join hands in a campaign which features:

(1) The manufacturers, (2) the jobbers, (3) the contractors, (4) the dealers and (5) the utilities.

To date a pioneering job has had to be done. In the main that pioneering has been carried forward by the manufacturers, the jobbers and the utilities. There was a time when neither the range nor the refrigerator represented profitable business to the dealer. Now, however, that has all changed. In the process of the change inevitable animosities have been developed. But they are not insurmountable. Manufacturers, jobbers and utilities clearly can join hands in the problems of research, production, distribution, advertising and sales training. Space forbids an elaboration here of these possibilities. But the possibilities are both real and rich. The contractors, no doubt, will do something in the field of selling appliances, but it seems to me they have a wonderful opportunity in helping to work out not only adequate but cheaper wiring jobs. That is really a creative and a selling assignment—a great challenge to the best of organizations.

There can be no question about the relationships which have been built up as between utilities and dealers. One cannot go up and down our territory not to discover it. Then, too, legislative evidence is altogether too clear to allow of doubt. Kansas and Oklahoma already have legislated against utility selling. Bills aimed at the same end have also, this year, been introduced in the legislatures of Texas, New Hampshire, Pennslyvania, New York, Michigan, Massachusetts, Connecticut and Ohio. But such legislation, I am sure, is not the answer to the difficulty. The pioneering days in many of the appliances are largely over. More and more the dealers can come into the field and

* An abstract.

carry on the sales of accepted appliances. Our own figures set up quotas for 1937 providing that the dealers shall sell 86 per cent of the appliances, whereas our utility will sell but 14. It is just good sense that we should work through 1,200 dealer salesmen rather than be limited to our own 200.

Dealers and utilities need to get together on three fundamental problems:

1. Utility salesmen must be compensated in such a way that they can work for the dealers rather than against them. Commission wages breed animosities. When a man must sell to pay his bills he goes out after sales whether they interfere with friendly relations or not.

2. Fundamental policies of price must be agreed upon as fair both to the utilities and dealers.

3. Terms must be such that dealers can do profitable business under them.

The sensible answer seems to lie in the coordinated efforts of both the utilities and dealers. There will be plenty of work for the utilities to do, such as pioneering the use of new appliances, planning sales campaigns, setting up national and local advertising campaigns, stimulating outstanding exhibitions, training salesmen, and demonstrating efficient use of appliances.

Certainly there is field enough to challenge the best energies in any utility. Such a program will leave us still in the field, but it will also enable the dealers to do a profitable business and will stimulate them more and more to do the selling job ahead of us. After all, our major concern is to put load on the lines. It is good sense to use to the full every agency now available.

Residential Sales Bureau†

Introductory Statement

THE Residential Sales Bureau was set up with two committees: one on home modernization to cover all electric home devices; and one on home service to treat of the work of home service departments of the companies devoting their activities to promoting cooking and lighting. In this committee a vice-chairman for home lighting was appointed.

At the Salt Lake meeting of the Business Development Section both these committtees held committee conferences on Thursday afternoon, March 25, and Friday morning, March 26. A program for discussion had previously been set up and subjects had been assigned to various members of the committee and others for presentation, after which these subjects were opened up for general discussion.

At the general session at the Salt Lake meeting, given over to the Residential Sales Bureau, reports of both these committees were heard as was a report on the progress of the home lighting activity. These are published herein along with extracts from some of the papers presented by individuals at the committee conferences.

As a part of the Residential Sales Bureau program, C. P. Keenan, Detroit Edison Co., discussed the selling of ranges and water heaters by his company, and K. M. Robinson, Idaho Power Co., told of the national progress in water heating. These talks were not prepared for publication.

The reports and papers of the bureau committees follow.

† W. A. Huckins, Utah Power & Light Co., Chairman; F. E. Ross, Puget Sound Power & Light Co., Vice-Chairman; Chairman, Home Modernization Committee, George W. Madison, Portland General Electric Co.; Chairman, Home Service Committee, Nancy Finch, Utah Power & Light Co.; Vice Chairman for Home Lighting, Walter E. Potter, Incandescent Lamp Dept., General Electric Co.

Home Modernization*

By GEORGE W. MADISON
Portland General Electric Co.

IN submitting the following report covering the conferences of the Home Modernization Committee, I wish first to offer my whole-hearted endorsement to the conference discussion form of meeting. It was the unanimous opinion of those who attended the conference sessions that they were productive of more valuable and usable information than previous meetings.

The following outline formed the basis of the committee's discussion. The committee member indicated led the discussion of the question assigned him and the remarks following the question are the result of the conference discussion.

1. G. S. Dawson, British Columbia Electric Railway Co., Ltd.—Do your rural salesmen sell ranges, water heaters, and refrigerators as well as commercial farm equipment such as utility motors, pumping equipment, brooders, etc.?

The discussion by representatives of the eleven member companies established that the majority were most successful in their promotional efforts, by maintaining separate sales groups for the development of rural load. One group being assigned the definite responsibility for the sales of strictly residential equipment and the other for the commercial farm equipment. The majority, utilities do not actually sell the commercial farm equipment, but devote their effort in behalf of equipment dealers.

2. J. B. Buman, Northwestern Electric Co.—(a) To what extent do you cooperate with dealers in supplying advertising assistance; compensation to your salesmen for sales made by dealers, financing dealer paper, etc.? (b) How have you best organized a cooperative activity with dealers?

There is an increasing effort to cooperate with dealer outlets through advertising by the utilities in a manner that will permit the dealer to expand his limited advertising appropriation to better advantage through tie-in type ads.

There is no effort being made by reporting members to contribute direct financial assistance to dealer advertising. The same is true with respect to financing dealer paper, it being the consensus that adequate low cost financing is available to the dealer from commercial sources.

Nearly all reporting members have some method for compensating their

* George W. Madison, Portland General Electric Co., Chairman; B. C. Electric Railway Co., G. S. Dawson; Eastern Oregon Light & Power Co., Leon Gray; Idaho Power Co., Fred Ingraham; The Montana Power Co., I. L. Comstock; Mountain States Power Co., Harold Ferris; Northwestern Electric Co., J. B. Buman; Pacific Power & Light Co., Guy E. Davis; Puget Sound Power & Light Co., Henry Kruse; Utah Power & Light Co., J. F. McAllister; The Washington Water Power Co., Ross B. McElroy.

own sales organizations for sales of ranges and water heaters made by dealers where there is a record of constructive contact by utility salesmen prior to the sale.

3. Ross B. McElroy, The Washington Water Power Co.—To what extent do your employees outside of the sales department participate in your sales promotion?

All companies are making an active effort to gain the cooperation of all employees in their promotional activities. They generally pay a prospect commission or tip bonus for leads that result in sales.

Several companies successfully encourage their employees to participate in their campaigns for the sale of I. E. S. lamps, roasters and similar minor load-building appliances, and at least two companies place a definite responsibility on all employees in their smaller communities to sell all loadbuilding appliances.

4. J. F. McAllister, Utah Power & Light Co.—Have you used Trial Plan of installation to promote range and water heater sales and with what success?

The trial plan of installation of water heaters has been generally used as a vehicle for the introduction and establishment of water heaters sold for use on the recently introduced off-peak rates. This method of sale is heartily endorsed by all companies who have used it. Losses through return of trial equipment are reported to be no more than normal sales mortality.

Practically no use has been made of the trial installation plan for selling electric ranges although isolated instances were reported where trial installations had been made with satisfactory results.

5. Guy E. Davis, Pacific Power & Light Co.—How have you utilized cooking demonstrations including group luncheons, newspaper cooking schools, home luncheon demonstrations and personal home calls by your home service women?

A summary of the discussion on this question would be quite diversified if considered from the standpoint of various activities in the home service field. The principal revelation of the discussion, however, was that all companies are directing their efforts primarily to secure active sales assistance from their home service departments.

Demonstrations and class instructions are designed to interest new prospective purchasers as well as users. The sales features and advantages of electric equipment are stressed almost to the point of excluding recipe instruction.

6. Henry Kruse, Puget Sound Power & Light Co.—Have you successfully used truck and trailer presentations of electric equipment in urban or rural territories?

Three or four companies have made limited experiments in the use of truck and trailer presentations of electric equipment in urban and rural territories, but they were generally of the opinion that the expense was not justified by the results obtained.

7. Fred Ingraham, Idaho Power Co.—What is your company's attitude towards the promotion of socket appliances including laundry equipment?

Discussion of this subject developed that utilities generally were leaving the active selling of all minor appliances to the dealers. Those most actively engaged in dealer cooperative activities expressed the belief that the sponsoring of minor appliance campaigns by utilities was necessary to secure maximum dealer activity, and where a sincere policy of dealer cooperation is carried out generally successful results were obtained.

8. Leon Gray, Eastern Oregon Light & Power Co.—What is your method of meeting fuel competition in the promotion of water heaters?

The answer to this question, practically unanimous, was that the completely automatic electric water heater offered such a superior service to an unhandy, unregulated fuel heating system that it was only necessary to stress the service advantages of the electric system to the prospect to win his approval. This has been backed up by user testimonials with splendid results.

9. Harold Ferris, Mountain States Power Co.—What was the basis of your most successful promotional activity and advertising campaign during 1936?

This question developed three answers that were reported as being unusually productive of results. The first was the offer of free wiring for electric ranges by several reporting utilities; second, the use of a specially priced leader range; and, third, the offer of a $25.00 allowance for customer's old fuel type range. Each of these promotional activities were enthusiastically endorsed by the reporting members.

10. I. L. Comstock, Montana Power Co.—Are you using any well defined plan to develop the replacement market on electric ranges and what percentage of your 1936 sales of ranges were replacements?

All discussion of this question developed the fact that the replacement of existing electric ranges is a major problem immediately facing the utilities, several reporting that in excess of 30 per cent of their 1936 sales were replacements. There have been some inroads made by competitive equipment largely among those customers having the older equipment that is obsolete by comparison with the modern ranges. It was generally felt that all older users should be surveyed as rapidly as possible and acquainted with the improvements that have been made in electric ranges and also re-educated in the use and advantages of the equipment they still own.

Economic conditions during recent years have removed a surprising number of electric ranges from service which are still in customers' possession and a plan of re-education should restore many of these to use.

11. Discussion.—(a) What is the average number of meters per salesman, residential and rural? (b) How are your salesmen compensated?

The average assignment of meters per salesman was found to be from 1,500 to 2,000, although two companies reported a smaller number per man.

Compensation plans were as varied as there were companies reporting, but the general rule was that the compensation was based on an estimated annual revenue percentage rather than on a percentage of the selling price of the equipment.

12. G. W. Madison, Portland General Electric Co.—To what exent has your company used kitchen planning as a sales aid and results therefrom?

Kitchen planning as a sales aid has been used to a very limited degree by most of the reporting companies. Those who have used it have largely availed themselves of the services offered by manufacturing organizations. The idea of kitchen modernizing has been extensively promoted by advertising, but actual planning of kitchen for customers is still in the process of development.

One company reports the actual preparation of over 500 kitchen plans in its own planning department. These plans resulted in sales of two appliances per plan drawn. There are six full-time draftsmen employed drawing plans and the production cost approximates $5 per plan, with reduction in this cost anticipated.

Operation of the kitchen planning department has built good customer relations with building contractors, material and furnishing dealers and architects generally. The majority of new home construction in this company's territory embodies the fundamentals of a planned kitchen.

Appended as a supplement to this report are extracts from two papers presented at the committee conferences as follows:

"Trial Plan of Installation to Promote Range and Water Heater Sales," by J. F. McAllister, and "The Utility Attitude Toward the Promotion of Socket Appliances," by F. M. Ingraham.

Trial Plan to Promote Ranges, Water Heaters

By J. F. McALLISTER
Utah Power & Light Co.

THE Utah Power & Light Co. has actively promoted range sales since the formation of the company in 1912. Our records show an appreciable number of new range connections made every year since that time. At the present time, approximately 30 per cent of our domestic and farm customers are using electric ranges. We anticipate 3,500 to 4,000 new range users will be sold ranges because of our activities this year. Acceptance has been built up to the point where we feel that extraordinary sales promotion features such as trial installation, free wiring or extended terms are not necessary.

The company records also disclose the fact that some water heaters have been connected to our lines each year since the formation of the company in 1912. However, no substantial yearly volume of new connections was reached until 1929 when we established what we then considered was a real water heating electric rate. In that year more than 1,000 new water heaters were installed in the homes of our customers and the following year more than 1,200 were connected. In 1931 only half of the preceding year's results were attained and in 1932 our efforts results in a red figure being shown on our sales record. In 1934 we established a new water heating rate which was approximately half the preceding rate and which was more in line with other forms of energy providing, automatic water heating service.

In order to convince the employees of the power company, especially the salesmen, and also the general public that our new rate would result in bills for water heating which were in line with the value of the service, we adopted the trial installation method of selling water heaters. Our plan calls for an actual contract and a down-payment on the water heater with the understanding that if within 60 days after installation the customer does not want the water heater, it may be returned and his down-payment will be refunded with the return of their contract.

This trial plan was evidence of confidence in electric water heating on the part of the management, and it did more than anything else to re-establish confidence in the minds of our sales organization as to the adequacy of the heater and the competitive cost of the service. During the first year the trial offer was in effect, 434 water heaters were sold. Nearly a thousand heaters were sold in 1936. We confidently expect 1,500 water heaters will be sold during the coming year.

We have cheap natural gas available in 80 per cent of our territory, the use of which is being promoted by a well-organized and aggressive gas company. The prices of automatic gas heaters have been below those quoted on electric water heaters. Because of these facts and because electric water heating gained a reputation in 1929-31 as a high-priced service, we felt justified in offering the 60-day trial offer plan.

Returns of water heaters for all reasons including credit, removal of families, deaths, etc., have been no more, relatively, than reverts of ranges, refrigerators or other major items where the trial is not in use.

Utility Attitude Toward Promotion Of Socket Appliances

By F. M. INGRAHAM
Idaho Power Co.

IT IS vital to good electric utility load building to include in the program the promotion of socket appliances for the following main reasons: (1) Their use leads to the purchase and use of the major load building appliances—develops the low user; (2) stimulates dealer interest in the sale of electrical equipment—here we must assume leadership; (3) they require little or no added utility investment to supply them and having exceptional diversity and net revenue building characteristics.

Idaho Power Co. uses the following sales promotional methods for socket appliances including laundry equipment: (1) Active dealer cooperative plan; (2) salesmen selling all appliances and services; (3) store activities, with window and floor displays and demonstrations; (4) active home service work selling the use and actually making sales; (5) other employee participation in sales; (6) traveling displays through use of trailer or kitchen coach, particularly in small communities and rural territories.

By being active in selling the small appliance, dealer interest is sustained. We must look to the dealer for the major portion of this business. He can stock and sell this type of merchandise at a profit. Cooperation with the dealer is pre-arranged so that he can stock the featured item, provide for advertising, and understand all the conditions of the activity.

The present sales organization is used. We could not hope, nor would it be practical, to increase the sales force to include specialty salesmen to sell socket appliances. We are firmly of the belief that all service selling by utility salesmen is today the best and most economical method to follow.

We expect the salesman to produce sales volume either in dollars and cents or estimated annual revenue. Since the salesman's tendency is to concentrate his attention on the sale of larger units, particularly the load building device, it takes constant sales supervision to keep him selling socket appliances including laundry equipment.

The home service department plays a very important part in carrying the program of selling health and labor saving appliances. This can be brought about principally through the selling of use of the appliances in the home. The use of any appliance may be stimulated if the user can be shown new recipes and ways of using her equipment that will be of greater advantage. Group demonstrations on the sales floor or in the customer's home are of value.

Employees other than the members of the sales organization will participate when arrangements are made to pay a small extra commission during a special activity. Servicemen, meter readers, cashiers and clerks will sell appliances to their friends and customers whom they know or contact. The best example of this in our organization is our annual fall Mazda lamp campaign, where a meter reader made over $115 in extra commission. Any employee activity in appliances requires more pep talk and supervising to keep up the enthusiasm to a degree where they like to sell. Perhaps if a regular scheduled program was maintained, in-

creased interest would be manifested. Manufacturers of small socket appliances could help this situation by giving a greater discount to be used as extra commissions for sales. This is being done by some vacuum cleaner manufacturers.

We have used the traveling kitchen coach the past two years. Health and labor saving appliances were shown and on occasions were demonstrated. We did not sell directly and deliver from the coach. This method reached many rural customers. We plan this year to operate one or more trailers over our territory with the intention of selling and delivering direct from the coach. We believe with the proper supervision and the right type of man with the trailer a more thorough job can be done in selling socket appliances in the rural territory.

Home Service Report*

By NANCY FINCH
Utah Power & Light Co.

WE have been told: That we must sell our companies; sell our services; sell our appliances to use service; sell use; we must handle problems of service, rates, and high bill complaints to the customer's satisfaction; we must get into schools, churches and homes. All of this we must do in terms that will interest and be understandable to women in homes. All advertising and all publicity must be directed to home use. We should cooperate with all other dealers in electric equipment, because we must help them to increase their sales. So, as a company we hire men who are specialists in each of these fields, because each one is a big job and a big problem and is very important. Then we hire home service women to be masters of all of these fields, plus being skilled operators of all the appliances that are sold. How many of you men can operate every appliance that you sell?

Background of the Business

This is a changing business. It has evolved from selling large use to home use; from men customers to women customers, since women are responsible for the spending of better than 82 per cent of the earned incomes in America; from selling in offices and factories to selling in homes. Men in this business remain too technical . . . . they still love facts and figures and materials and construction and operation; all of which is of little interest to a woman.

Home Service Work

1. All of the problems which arise in the above statements must be handled by the women in the home service department.

a. We do sell our companies, because we like them and we like the people with whom we work. If the public liked us half so well, we would have no problems.

b. We do sell service, because no one can appreciate more what it will mean to any woman in her home by way of economy and advantages than the home advisor.

c. We do sell appliances, because only through them can we make women realize the better art of living.

d. We handle problems of equipment, rates, and high bills, because we are just as unhappy about these problems as the homemaker. We can never be happy when any woman is less than perfectly happy with her equipment or service.

e. We are part of the advertising department in that we advertise by and through our promotional schools, classes, and lectures; through radio programs and home contacts.

f. We train dealer salesmen and help dealers to sell and to keep customers by educating them in use of electric equipment.

2. Those who attended our Home Service Committee meetings were, I'm sure, impressed with:

a. The knowledge of these women of their own jobs and the work to be done.

b. With their ambitious plans for spreading use . . . . how unhappy they are to find homes and schools without electric equipment.

c. Their acquaintance with problems of their companies as a whole and with problems of management, of marketing possibilities, and of appliance saturation.

d. How awake they are to the possibilities of greater home use of all appliances.

e. And, above all, with their enthusiasm for the work which they are doing.

Committee Conference

In our committee sessions in Salt Lake we have discussed some of these major problems of our departments.

1. An all-year lighting program was presented by Mary Dysart, The Washington Power Co. In this she brought out the possibilities of lighting activities for the entire year. The increased possibilities of improving lighting in homes if we give the customer help with a complete wiring for the home. The work her company has done to provide drawn plans of wiring systems in homes, and also the idea of selling customers on the rate when they are sold on the appliance, seems most worthwhile.

2. A combined home service-home lighting program vs. a specialized program was discussed by Helen Swanson, Idaho Power Co. Miss Swanson's department is just in the period of change from the specialized program to the all-'round program, and in her opinion the value of each type of organization is still to be measured in terms of rural and urban territory, in cost of operation, and in problems of supervision. Utah Power & Light Company's experience indicates the all 'round program is best from a point of enthusiasm among our women and better results in production.

3. Hazel McCarty, Utah Power & Light Co., reviewed the possibilities in selling small appliances and the work that could be done by the home service department in selling them and keeping them sold by giving customers ideas on new uses, and by keeping in touch with customers to see that these appliances were kept in repair and ready for use. The department could offer, and in most cases does offer, the opportunity for customers to bring in these appliances for cleaning and repairing.

4. Beth Fillmore, Portland General Electric Co., presented a very fine report on the work her department is doing in planning for results in users' schools. Such group contacts, Mrs. Fillmore stated, could not take the place entirely of individual contacts in homes to give women personal help and education, but they could be used to cover the range and its operation and uses and many advantages with visual instruction, which is immeasurably valuable in any kind of contact. Such group contacts, of course, also cut down the cost of calls and education, and help to ease the supervision problem.

5. A planned program for contact with schools was explained by Mildred Elrod, Northwestern Electric Co. She explained some of the difficulties which had to be overcome in order to get into the schools to give instruction in electric cookery, and how these problems were answered and the field developed for

* Nancy Finch, Utah Power & Light Co., Chairman; Walter E. Potter, Incandescent Lamp Department, General Electric Co., Vice-Chairman for Home Lighting; B. C. Electric Railway Co., Jean Mutch; Idaho Power Co., Helen Swanson; Mountain States Power Co., Estella Dorgan; Northwestern Electric Co., Mildred Elrod; Pacific Power & Light Co., Audrey Herrington; Portland General Electric Co., Beth Fillmore; Puget Sound Power & Light Co., Edith Rauch; The Washington Water Power Co., Mary Dysart.

future installation of equipment and use of service. Our schools; grade, high school, and college, make splendid fields for working to educate in use of electric equipment, and plans for working with these schools are of great value to home service departments.

6. Edith Rauch, Puget Sound Power & Light Co., told of her success with the radio programs put on by her department. Such information is of value, because it is the newest medium to be used to advertise electric cookery and the services of the home advisor.

7. Ensemble selling is just beginning to take the attention of the selling world, and for no problem does it work better than in selling the all-electric kitchen. Ardell Welch, Utah Power & Light Co., told of the work being done to advertise and encourage the installation of complete kitchens in schools, churches, and homes.

8. Home service dealer cooperation was discussed by Jean Nelden, Utah Power & Light Co., who brought out some points on the kind of education which has had to be provided for dealer salesmen to help them sell their own equipment. She also discussed changes needed in this work in the future in order to make it a really progressive program.

9. As a conclusion to the Home Service Committee program, a round-table discussion was had on some of our major problems, such as: supervision, ways in which we can check home service results, what we want to measure by these checks, methods of keeping records and the kind of records we should have to show results, whether or not it is a good thing to have home service campaigns, and lastly just how we can prove this activity is paying its way in our companies.

Appended as a supplement to this report are extracts from papers presented personally at the committee conference, or sent to the conference to be read in the absence of the authors, as follows:

"How to Handle a Trouble Call on a Range," Audrey Herrington, Pacific Power & Light Co.

"What Information is Most Desired and Valued by our Customers," Audrey Herrington, Pacific Power & Light Co.

"Making Certain that Small Appliances Are Used," Estella Dorgan, Mountain States Power Co.

"Arranging, Getting Attendance and Planning for Group User Classes," Beth Fillmore, Portland General Electric Co.

"Planning Radio Programs that Sell," Edith Rauch, Puget Sound Power & Light Co.

"Selling the All-Electric Kitchen," Ardell Welch, Utah Power & Light Co.

How to Handle a Trouble Call On a Range

By AUDREY HERRINGTON
Pacific Power & Light Co.

BEFORE going out on a range complaint, we first ascertain from the office what the trouble is so that we know what we are up against when we arrive at the customer's house. We call by appointment at her convenience as soon as possible after the complaint is made, and attempt to keep the appointment on the dot, as the housewife generally has her day scheduled. A smile is the best entering wedge. Assume in your own mind that she is glad to have you.

We ask her to tell her story or complaint, and as she proceeds in the telling of it, we analyze it and try to find out what the fault might be. If it is a baking complaint, and I will touch on this phase only, we ask to see her pans and how she places them in the oven. If we do not see anything wrong in her methods, pans, etc., then we find out about the recipe and methods of preparing it. Then if we have not located the trouble, we check the levelness, the heat and the working of the thermostat. If all this seems to be in order and she has used temperatures according to the instruction book, we follow up with a short baking process such as biscuits baked on a biscuit sheet, or a simple cake recipe baked in an ordinary tin pan about fifteen inches long and eight inches wide. This gives a complete picture of the levelness of the oven, the type of browning and whether it is a low or high oven.

If after making this test and showing her the results she is not convinced, we then bake her own pet recipe with which she has had trouble, having her prepare the product and place it in the oven. This gives us the chance to watch her and perhaps make suggestions for producing a better product. By having her tell her story and place the pans herself, we are able to determine whether she is following instructions, and to learn what type of pans she is using, and of course, pans have a lot to do with baking results. If she has poor pans and seems reluctant to buy new ones, we suggest that she is an earning power in the home and of course should have proper equipment to work with, and make her feel that it is a good investment. If the results show that it is the fault of the range, we are frank to tell her and are only too glad to attempt to have it fixed as soon as possible. Then we make a follow up call to see if she is satisfied.

What Customers Want to Know

By AUDREY HERRINGTON
Pacific Power & Light Co.

I BELIEVE that most of all our customers want to know, "What will electricity do for me and what are its advantages?" While I feel that the history of the company, its rate structures and policies are essential in our own education for a background, our customers are interested in the advantages offered by our commodity. So the problem of what to teach them is still before us. We should educate them to the terms we use in speaking of electricity, particularly as to measurements and use, so that when we talk to them the terms we use should be as familiar to them as when we speak of the foot, quart or pound.

Many of us are so familiar with electrical terms that we speak in the vernacular, and it leaves the customer with a very odd picture. A woman called a public utility office and said, "I have been trying to teach my dog not to chew the electric cords about the house. If he chewed the cord in two, and the juice came out on the floor, would I get a shock if I mopped it up?" As long as there is anyone who does not know we are being facetious when we talk about "juice", I think we need to be very careful about the way we phrase information. Ideally, we might set up a minimum electric vocabulary of the five terms—watt, volt, ampere, circuit and fuse. If these terms were a part of the customer's vocabulary, she would have the basis for interpreting the information stamped on each piece of equipment in terms of the electric service they are supposed to render. This may seem too ambitious a plan. If so, we can at least concentrate on conveying the meaning of the term "kilowatt-hour".

Truly, she may not know exactly what the term means technically, but, how many customers can define an inch or an acre? So, if you are faint hearted of the "ideal vocabulary", you can at least think in terms of making the term "kilowatt-hour" take on a meaning.

We have the greatest labor saving commodity to sell and, on that basis and through the merchandise we have to offer, it should be sold, not only because of its availability but because of its adaptability to so many physical tasks. So it is important that our customers become familiar with electricity and its use. It should be sold as a servant to the people, payng its way as it goes, through labor saving devices. Our customers want to know about the new and modern way of living, and it is up to us to tell them what these labor saving devices, which can be operated only through our commodity, will do for them.

Group User-Classes

By BETH FILLMORE
Portland General Electric Co.

THE STARTING place in any discussion of a newer way of doing a job is to be definitely convinced of the need for doing the job at all. In this case, the question naturally arises —why have classes for new users of equipment? We will all agree, I am sure, that there is no finer sales producer than an enthusiastic user. Notice I do not use the trite expression "satisfied user"—because for a customer to be passively satisfied with a new piece of equipment isn't enough to create a desire among her group of friends for similar equipment. But if that same customer is enthusiastic about her equipment because it has given her more free time from the kitchen, or has raised the health standard in her family, or has made possible a new and easier way of cooking then her enthusiasm will result in sales for us among her friends. This enthusiasm will come from a thorough understanding of the use of her equipment.

From our expenrience with group classes, planned especially for new users, I am convinced that it is the most efficient method of filling this objective, because (1) It gives more contacts, with less money and time being spent; (2) it is possible to give a more thorough and complete demonstration in a company kitchen than in a user's home; (3) the demonstration can be visual, doing the actual cooking rather than just an explanation of the cooking; (4) the time is definitely planned, for that purpose (in a home there are likely to be interruptions); (5) users benefit from contact with other users. (Here Mrs. Fillmore discussed these classes under the following outline.)

Arranging the new user classes:

1. Place:
   Holding the classes in a model, all-electric kitchen is a splendid opportunity for promotion of "all-electric kitchens", and will publicize the Kitchen Planning Service of the company.
2. Time:
   Attendance record from morning and afternoon classes.
3. Equipment.
4. Personnel.

Getting attendance:

1. Conduct user class for salesmen and servicemen.
2. Cards.
3. Letters.
4. Radio.

Planning new user classes:

1. Plan user sales demonstration.
2. Cooking program used.
   Welcome guests.

Purpose of class:

Not cooking school, but a demonstration of electric cookery methods to assure homemakers of advantages in using their ranges.

1. Health.
2. Convenience.
3. Economy.

Plan of demonstration:

Will include explanation and visual demonstration of four parts of range.

1. Thrift cooker and economizer unit.
2. Surface.
3. Broiler.
4. Oven.

(Here Mrs. Fillmore elaborated the demonstration of each part of the range.)

Making Certain that Small Appliances Are Used

By ESTELLA DORGAN
Mountian States Power Co.

INTEREST and convenience are the answers to this problem. Therefore, may I suggest that you keep talking about your new small appliances. Use them in your own homes when entertaining. Set up really attractive displays in your stores and these displays dusted and fresh in appearance. Use colorful new pottery or the even newer wooden dishes with your displays. These out of the ordinary dishes will bring out the beauty of material and design in your appliances and renew interest in them.

Why not offer a special sale, or allowance, on appliance cords? We all know that an old or broken cord may be the answer to many of these "dormant" appliances. Also, wouldn't it be a good idea to make plans whereby your customers may have additional convenience outlets installed at a minimum cost?

Why not ask our friends or customers as often as we may courteously do so if they are enjoying the continued use of their coffee maker, toaster, waffle iron, grill, iron, and so on, down through the list? Perhaps we will find that some minor defect or lack of understanding is keeping the owner from using some appliance. Your interest will be welcomed and you may be able to suggest the necessary adjustment and, in the meantime, you will be getting a good check on the use and condition of the small appliances in your community.

Let's encourage the placing of appliances where they will be convenient to use, easy to clean and always there for instant service. Sometimes it is such a task to get the toaster out of hiding back somewhere on a shelf that we toast the bread on top of the stove, or in the oven, instead. Then there are crumbs falling around and we are annoyed, all because the toaster wasn't in a convenient place, available without getting in the ladder and hose department.

Mysterious Gifts

Many electrical appliances are given as presents each year. Often the new owner knows very little about the equipment and may use it very little because she lacks instruction. Recently a woman called our office concerning her new electric mixer which had just been presented to her by her son in another city. She was trying to mix a cake, using cold, hard butter and high speed, and was not having success. Fortunately, she felt entirely welcome to call us for help or instruction. We have been fostering this mental attitude in our customers for years and this was a case where our interest was rewarded. The mixer was not put on the shelf among the other "souvenirs."

One suggestion for checking up on the use of small appliances is to telephone or send a notice to customers just about the time the appliance is a year old. Tell them you are checking on the condition of the equipment at that time and offer suggestions for use. Another method is to employ a girl during vacation time to make such a survey. Some little premium, or plan for demonstration, may be advertised in the newspapers for certain days, and information gathered through the response to this invitation.

Radio Programs that Sell

By EDITH RAUCH
Puget Sound Power & Light Co.

TODAY we radio listeners require something out of the ordinary, something new to attract our attention. People do not listen to the radio any more just for the novelty of it. They listen to programs they like, and what they don't like they can easily turn off. Therefore, in planning a radio campaign, an advertiser has many things to consider; the best time of day to reach the group of listeners he wants to reach, the type of program that will appeal to that group, and the cost.

In planning local radio programs that sell, we are confronted with the fact that the nation's best entertainers have been drawn into radio, and that the national network programs are available by just a turn of the dial. I believe that you will agree with me that there is little likelihood of finding local talent that can compete with the national networks in the presentation of entertainment programs. Realizing the competition there would be in presenting a program featuring entertainment, we naturally consider programs of an educational nature that will attract the audience whom we wish to reach. In planning this type of program we try to make them as interesting as possible, and present the subject by one fully qualified to give the listeners information and facts in such a way that a desire will be created to buy that product or service.

To a very large extent radio broadcast advertising is personal selling, for it establishes a person-to-person link with the customer. The personality of the speaker colors the words of the program or announcement, just as a salesman's personality colors his sales presentation. The advertising message, being personalized, becomes persuasive.

I will describe the radio programs put on by the home service department of my company. January 1935 saw our first home service program go on the air, and we have been on weekly with a quarter-hour each Friday morning since that time. We decided on Friday, for on that day the homemaker is especially interested in food and its preparation. The newspapers feature cookery pages and carry food advertisements ready for Saturday shopping. Surveys have shown that programs with music are the choice of most listeners, so we have music at the opening and closing of the program. If the subject of the program is of such a nature that there can be a break, we have music also at some time during the course of the program.

The programs are planned to be informal and friendly chats with the homemakers. We do give recipes occa- up with too many recipes. I believe that recipes over the air should be given very slowly and deliberately, to allow time for Mrs. Homemaker to write them down. Occasionally I offer to send copies of the recipes which have been given during the broadcast to anyone who cares to write for them. I always have an abundance of requests. This is a splendid means of checking our audience, and it is gratifying to know that we have listeners from Oregon to British Columbia.

Our listeners are prospective buyers of electric ranges and refrigerators if they do not already have this equipment. Frequently letters are received as a result of these programs, requesting advice and recommendations in the selection of new electrical equipment. Of course these are followed up closely and have resulted in many sales of merchandise.

The home service programs, because they have been planned to give instructions on the correct use of electric ranges, as well as all other homemaking problems, have cut down the number of customer dissatisfaction calls, and thus have saved a considerable amount in the operating cost of the department.

After the Home Service Department was well under way, it was decided to combine it with the Home Lighting Department. Here too, we had a definite service to offer. We believed that a morning radio program, devoted to the women, would not be entirely successful in selling new and better lighting service. We also wanted to tell our story to the men and in fact, to the whole family, so we decided on a Sunday afternoon time. It was then necessary to select a program that would fit that particular time and day. A program of sweet, quieting music was decided upon, called "Light Lyrics", to sell the service of the department and the necessity of adequate lighting in the home for safe and comfortable seeing. Short dramatizations are worked into these programs, pointing out the discomforts of poor lighting and the joys of adequate lighting. The plots of many of these dramatizations were contributed by the home service representatives from actual cases they had discovered in their field work. I believe I can safely say that this series has been one of our most successful programs, for the members of the department are continually kept busy visiting homes, testing lighting conditions, and recommending changes for improvements.

Selling All-Electric Kitchens

By ARDELL WELCH
Utah Power & Light Co.

THE SELLING of the all electric kitchen should be built around the idea of satisfying human needs. This can be done best by having an all electric kitchen set up in our stores for giving demonstrations. It should be installed where it will attract attention, and in our demonstrations we should bring out the ten advantages of electric cookery and prove the five buying motives: gain and economy; protection and safety; comfort and convenience; satisfaction of pride; and satisfaction of affection. There should be lighted display panels at the sides of the electric kitchen, naming the ten advantages.

We should work with the home economics teachers in the schools. In our city they bring their classes to our show room where our electric kitchen is. We go through the advantages of the electric kitchen with them, using the mixer, range, refrigerator, dishwasher, hot water heater and correct lighting. This builds the idea of the electric kitchen in the minds of our future homemakers. In one of our high schools a model kitchen has just been completed and two members of the company home service department are responsible for a good share of the plan.

In the Girl Scout classes that come to our store, the scouts do the work themselves under our supervision. They take notes and make up complete books which we mark.

Regular public classes are given in our store. This class is a good place to bring in all the advantages, pointing to those on the lighted panels. We pass out slips of paper with the wording "Advantages of Electric Service" printed on them, and the customers check the ten advantages as we prove them. They sign these slips and pass them in for the drawing of prizes, which consist of the food that has been prepared and cooked at the school. We also gather prospects on slips called "Prospect Cards." The prospects for the small appliances and lighting are given to the home service department; the prospects for the large appliances are given to the salesmen. The home service advisor and the salesmen call at the homes of these prospects to get their decisions. Many sales have resulted from these prospects. The salesman should be encouraged to bring his prospects to see our all electric kitchens, so he can prove his points by actual demonstration.

It's an excellent idea to give schools for dealers and their sales people, and their wives. We also invite the electrical wiring contractors. The plumbers association can help us with the electric dishwasher installation, so we should get acquainted with them by inviting them to special demonstrations of the electric water heater and the dishwasher. Also special classes for club groups, and the Parent-Teachers' Associations are effective.

A file of pictures of all types of electric kitchens will help. They tell a good story easier than blue prints do. For the planning of kitchens in homes we loan our pictures in order that the customers may study them with their families. We go to their homes, if it is a remodeling job, draw sketches and replace equipment.

We help department stores in designing kitchens for their stores, having just cmpleted one for Auerbach's store. We give help in planning the demonstration of electrical equipment in these kitchens.

Churches need help in planning their kitchens too. We also help supervise church dinners where electrical equipment is being used.

To sell good kitchen lighting, have a center fixture with a diffusing bowl and not less than a 100-watt globe. In the electric kitchen, have lights over the range, the sink, and the principal preparation surface, controlled by a pull chain or switch at that point. In suggesting proper wiring, provide for individual wall switches for ventilating fans, portable cookery, electric clock, radio, electric mixer, and water heater.

In radio programs, talk all electric kitchens. Suggest to listeners that they check their own kitchens as you give specifications and placement of the electric appliances and their advantages. Ask them to bring in to our home service department their own drawings and let us go over them.

Home Lighting Progress*

By WALTER E. POTTER
Incandescent Lamp Dept., General Electric Co.

A DISCUSSION of residential developments taken from all possible angles presents many varied patterns. It was only about four years ago that several individuals at Nela Park evolved the idea of sending Miss Mary Webber up into New York state to find out if the typical householders could be interested in having "lighting for seeing" in their homes.

The home lighting advisor plan as we know it today is an outgrowth of her experience in Utica that spring. Since then approximately 2,300 women have been employed by central stations and are on that job now. On the average, they make three lighting demonstrations per day in homes located in all parts of the country. That means there are 1,730,000 homes reached in a year—1¾-million families now hearing the "Science of Seeing" story in their living rooms and acting to better their lighting conditions for the first time.

In our northwest territory there are about 115 girls carrying this lighting message into the customers homes. Some companies are using the exclusive home lighting women and some companies use the combination all service women. Both groups are doing excellent work building kw.-hr. sales of lighting. It is impossible to draw fair comparisons between the two types of operations as many local factors and conditions materially affect the final results.

It is suggested that more complete records of the activities be kept to enable utility executives to determine accurately the effectiveness of their operations in this field. At previous meetings of this committee a uniform record chart has been suggested which shows the results of each woman's work as well as the entire department. Let us agree on some common method of measurement so that each may evaluate his own operation in comparison with other companies. Estimates of wattage added and increased revenue obtained are of little value unless verified by call-backs or checks of net kw.-hr. sales billed. Call-backs not only offer us an excellent opportunity to check load added but also give us a chance again to sell the use and value of our service.

Cost of obtaining the additional residential lighting load during 1936 varied from 52c to 72c per dollar of estimated annual revenue, depending upon what and how much advertising and executive expense was placed against the cost of the activity.

One outstanding fact presents itself in our entire lighting program, that is, a greater need for employee and executive education on lighting as well as other phases of our business. How many of us present have had our own homes modernized and improved with better lighting and are continuing to use it? How can we expect results from any activity or attempt to sell it to our customers unless we at least expose ourselves to it? Once you have relighted your own home and enjoyed the benefits of better lighting for thirty days, then will your lighting program go forward with tremendous strides.

One hundred per cent of all our residential customers immediately represent our home lighting market. I doubt if we can say this of any other class of service on our lines. How can we reach this market?

1. By a dominant advertising program—Selling and keeping in use any device requires consistent advertising. With lighting advertising there is no waste circulation. Whether our advertising is of the educational or propaganda type or of the merchandise type, each reaches a consuming market vitally interested. Mass education and mass selling requires advertising large enough in space to tell the lighting story and often enough to drive it home and permanently change peoples' ideas.

In our national magazines lighting advertising by manufacturers coupled with a vast amount of editorial features on proper lighting in the home are reaching into all of our customers' homes. We must carry on by personalizing and localizing the story spread by the interests and others such as school au-

* A report prepared for the Home Service Committee, Residential Sales Bureau, and presented at the annual meeting of the Business Development Section, Northwest Electric Light and Power Association.

thorities, eyesight specialists, paint manufacturers, and others.

Most lighting advertising has been seasonable during the fall months of the year and yet the use of lighting is far less seasonable than appears on the surface. The table of lamp bulb sales shows the "low" naturally in August at 6 per cent of the total with the "high" in December at 10.6 per cent. Therefore, our advertising should be used twelve months of the year, using enough space to tell the "seeing" story and high-spotting this activity in the fall and winter with additional space on merchandise. In this program we can effectively reach the low-use customers who are such a large factor on our lines. Let us not overlook the farm customer either who spends as many waking hours, if not more, under artificial lighting as does the urban customer. All of the utilities in this territory have used advertising fairly consistently and regularly. For the coming year plans should be made to increase this coverage.

2. *The utility should maintain leadership in lamp bulb sales*—Recent surveys in a number of cities developed that 10 per cent of the sockets were empty in the homes. This condition exists even in communities where utilities have free lamp renewals. If we apply the percentage of empty sockets to the hundreds of thousands of wired homes in our territory, knowing that homes average 29.3 sockets and that the average wattage lamp in use is 36.3 watts, it stands to reason that there are many kw. of load to be added by filling these sockets.

Sales to low-users grow slowly. Regularly added small increments of service mount up over the course of a year. For instance, a simple 100-watt lamp if burned three hours per day at a rate of 5c per kw.-hr. will produce $5.48 gross revenue per year. Even for a customer now using as much as $30 worth of service per year, this small amount of added service will provide better than an 18 per cent increase in yearly gross earnings of the utility.

Lamp sales leadership does not mean that the utility should necessarily lead in lamp sales. It does mean that in order to obtain the greatest load from all sockets the utility should assume the lead for all lamp sales in its territory. In addition to their own sales program they should be instrumental in inspiring the dealer to sell the right lamp for each use, to endeavor to sell more lamps and to be sure they are of proper voltage. This inspiration comes mainly from proper advertising and promotion. In this territory the large number of high voltage lamps being sold to customers and the low wattage bulbs being placed in lighting units designed for higher wattage is rather alarming. We know definitely that 25 per cent of the lamps shipped in the Northwest territory are at least 5 volts higher than the rated central station voltage. This figure alone represents a loss of better than ¼ million dollars in revenues to the utilities.

Surveys made in several communities indicate that when the utility is active in promoting lamp business the total per capita consumption of lamps is much higher than it is in communities where the utility does not put any particular stress on lamp merchandising.

In Cleveland, Ohio, during the past sixteen months, 40 home lighting advisors have put exactly 344,723 new Mazda lamps in sockets in Cleveland homes; 70,962 were of the 150-watt size which they gave away free, and the remaining 273,761, which they sold, ran between 75 and 100 watts. On the average, each girl disposed of 6,400 bulbs per year.

Empty socket campaigns conducted during the past years by both the Idaho Power Co., and the Montana Power Co., besides selling many thousand lamps and stimulating dealer sales, have shown better than 70 watts per bulb sold. Kw.-hr. sales have shown the results to be expected from this activity.

3. *Merchandise sales of lighting units promoted by utilities*—The surface has not been scratched. Most of the companies in this territory have conducted some kind of activity, principally on I. E. S. lamps. How far can we go in the ultimate sale of I. E. S. lamps? I refer to initial requirements, not replacements, which one day will be a natural market. Figures compiled now show that in 21 million wired homes there are now over 7 million refrigerators and 14 million radios. One refrigerator and two radios is considered the maximum for one home, but what is the minimum ideal per home for I. E. S. lamps? Certainly, an average of four is not too high. Considering only the homes having electric refrigerators, there is a market for 29 million I. E. S. lamps, whereas the homes with radio sets constitute a market for 58 million I. E. S. lamps. If we place the minimum ideal for the I. E. S. lamps in all wired homes, we have a potential market for 84 million lamps. Let us not expect one I. E. S. lamp to light an entire house, it can't even light one room adequately.

During 1935, 650,000 I. E. S. lamps were sold nationally, 80 per cent of them by utilities. Promotion on the part of manufacturers and other resulted in 1,250,000 I. E. S. lamps being sold during 1936, with 60 per cent by the utilities. This job represents less than 2 per cent of the available market.

The new homes to be built during 1937 alone represent a market for over 2 million I. E. S. lamps which is equivalant to the number of units sold in 1936. Producing at last year's rate we would still be more than ten years in meeting the bare requirements.

The 1937 objective calls for 5,000 additional I. E. S. dealers and doubling the number of lamps to be sold. I. E. S. lamp manufacturers are spending more than $50,000 this spring in national advertising promoting the "Seeing is Believing" demonstration through dealers urging the customer to "Buy Measured Light". This is in addition to the fall activity of 1936. More elaborate plans are being made now for the fall and winter of 1937.

4. *Company-Dealer Sales Activities*—Many utilities in the Northwest have conducted company and dealer I. E. S. sales activities. All of these have sold lamps and added revenue. Puget Sound Power & Light Co. conducted a window display contest among dealers that sold lamps and created interest. The employee and dealer campaign entitled "Go Getters" carried on by The Washington Water Power Co. was outstanding, not only from the sales standpoint, but also from a dealer relations angle.

It is recommended that campaign promotion be planned to obtain this quota of:

I. E. S. portables....10 per cent of residential meters.

Kitchen units....3 per cent of residential meters.

Wall portables (Pin-It-Ups).....5 per cent of residential meters.

Also, don't ovelook the farm market, low-use customers and our own employees. With a saturation of about 75 per cent of radios among rural customers there is a vast market here for at least one I. E. S. lamp to see by, to read by and to listen to the radio by. Just one I. E. S. lamp per utility employee means another large market. The low-use customers, who represent such a majority of our accounts, can be sold one lamp, as this appliance is needed, demanded by them, and within reach of their budget. Stress placed on these customers can bring them into a profitable account and make them boosters.

In 1932, 300 kw.-hr. was the average used by residential customers for lighting alone. In 1936, this is estimated to be 350 kw.-hr. By 1946, it is estimated 1,000 kw.-hr. will be the average, and a reasonable ultimate goal is 1,500 to 2,000 kw.-hr.

To reach this calls for greater public education along Better Light—Better Sight lines, and there is now a growing

acceptance to the ideals of this movement on the part of the public so this is by no means an impossibility.

5. Home Lighting or Home Service Departments—To educate the public requires in addition to all of the above home lighting or home service girls. Exclusive home lighting girls naturally produce the greatest kw.-hr. returns. They can be expected to and are averaging 160 kw. per year additional load. A combination service girl should add at least half this load. It is interesting to note that where combination operations are in effect, the girls trained originally in lighting generally do a better all-around job from the standpoint of number of calls, wattage added, revenue produced, expense return, etc.

We find the results of these home lighting and home service girls helping to sell service in other fields. Puget Sound Power & Light Co. recently sold a large office relighting job as a direct result of a thorough home lighting installation having been made in the customer's home first. No doubt there are many other cases of similar nature on record in your own utility. On every service call as well as on each lighting call-back there should be this opportunity to sell additional revenue benefits. Continuation of thorough training of these advisors will do much towards definitely creating active goodwill among customers with the addition of more kw.-hr. sold.

6. Supervision and Control—No matter what the immediate job ahead, whether one of sales, rates, gross or net, active goodwill, an important and far-reaching factor is more *adequate supervision* in the field and *executive control*. Lighting, being number one on our sales program, is vital enough to warrant the support of our top executives.

Any sales person contacting the public needs stimulation and renewal of enthusiasm occasionally. In this connection it is strongly urged that all supervisors working in the field spend time with all advisors actually making calls with them in the customers homes. Any advisor who objects to this procedure, as losing or affecting her prestige with the customers, cannot help admit a weakness in her sales work. Any supervisor who does not make these calls is negligent in her duty to the girls, the company and herself.

Advertising Committee*

Utility Advertising

By JAMES LIGHTBODY
B. C. Electric Railway Co.

THE time honored plan for a committee is for the chairman to wait until three weeks before the date of the convention and then write a hurried report which ostensibly comes from the committee as a whole but which the rest of the members take as read. Be that as it may, the report may be two things: (1) it may be the result of an investigation into, say, the use of static condensers in 5,000-egg incubators with the answer tabulated for companies of 10,000, 50,000 and 100,000 customers respectively and with plenty of variable factors in the margin; or (2) it may be some of the things the chairman has done that he is particularly proud of and wants his boss to hear about.

In the case of advertising, our problem is sometimes to keep the boss from thinking that we are doing too much advertising, and as for investigating the relative value of high light halftones and line drawings, advertising is in a state of flux too much ever to come to a final conclusion about anything. As soon as something new and good is discovered, everyone crowds the bandwagon so fast that in self preservation you have to get on another route.

So throughout advertising circles, it is conceded that nothing ever reaches a finality and the very best procedure is to compare notes, exchange experiences and tell about one's successes and failures. That is what our advertising committee has been doing, both here at this meeting and through the mail.

If you looked in at our meetings, you would have found us discussing familiar subjects such as (1) Better Lighting-Better Sight Advertising (2) Advertising to Farmers, (3) The Low Use Customer and (4) Dealer Helps.

If there ever was an educational plan which was made for advertising, it was Better Light, Better Sight. Every human being has eye sight and everyone is interested in saving it. Advertising tells a message to everyone. Ergo, advertising is the finest way to get over this idea. No idea spread with such rapidity as this, thanks to advertising. National advertising by lamp manufacturers, and local advertising by power companies has changed public thought over night.

There is still work to do. Not every home is well lighted. Many persons still think 20 foot-candles is too bright. Many still think that dim light is soft light and therefore easy on the eyes. It would take a thousand years to reach these people by salesmen but advertising can reach them all time after time.

We discussed the low use customer and we pass this along as a tip to next year's meeting to put him on the program among the headliners. He is your problem child and the class of subnormals is entirely too large. You may have noticed in ELECTRICAL WEST that one utility here in the west found 34 per cent of its customers never broke into its secondary rate. Here again is a job just made for advertising. It is our old friend the low average kw.-hr. consumption in a slightly different dress. We saw the general picture before; now we are getting down to details.

Last year, we discussed institutional versus promotional advertising and pretty well came to the conclusion that the best way to build goodwill was to talk about the cheapness of electric service. It isn't often that you come across one of these "You can't lose" propositions. If you talk about the cheapness of electric service in your ads, you help to sell appliances or lighting but if you don't sell anything, you make people think better of the power company anyway. Subconsciously, they get rid of that old idea that electricity is expensive which is behind much of

* Advertising Committee: James Lightbody, B. C. Electric Railway Co., Chairman; M. L. Cummings, Utah Power & Light Co., Vice Chairman; The California Oregon Power Co., H. D. Kem; Eastern Oregon Light & Power Co., Leon G. Gray; Gerber & Crossley Inc., Charles H. Devlin; Grays Harbor Railway & Light Co., F. W. Linklater; Idaho Power Co., Joe Imhoff; McCann Erickson Inc., Vernon Churchill; The Montana Power Co., J. C. Ryan; Northwestern Electric Co., George H. Wisting; Pacific Power & Light Co., Guy E. Davis; Portland General Electric Co., George W. Madison; Puget Sound Power & Light Co., Harvey Leach, L. A. Williams; Syverson-Kelley, Raymond T. Kelley; Washington Gas & Electric Co., R. T. Smalley; The Washington Water Power Co., R. B. McElroy.

the low consumption we are talking about.

This plan of advertising the cheapness of electricity is sweeping the country. The other day I got a book from the Edison Electric Institute showing a collection of ads from power companies all over the continent, and I was happy to note that such northwestern companies as Utah Power & Light Co., Puget Sound Power & Light Co. and The Washington Water Power Co. were represented.

The other day the advertising manager of a power company, not in this association, confided to me in a moment of candor that his company really did not believe in advertising. I would hardly have believed it if I had not read a remark made by J. R. Pershall of the Public Service Company of Northern Illinois last January. He said that an engineer's attitude towards advertising was that he didn't want to have anything to do with it because he couldn't find it on his blueprints.

I think most men in the business of selling realize very definitely what advertising will do and won't do and that goes for those in the commercial departments of a power company. But in all business, there are a great many others who are lukewarm about advertising. If they do any, it is because it seems to be a thing to do and they O. K. expenditures in a reluctant sort of way.

It is true you won't see advertising results on any blue print simply because the reflexes of people are not and never will be known with any degree of certainty.

But harking back to the low use customer and the average kw.-hr. consumption, here is a widespread educational movement. It is a case of educating people quickly to a new way of looking upon lighting and the use of electricity in general. Give this job of raising the low use customer into the hands of your advertising departments and we'll wager that it will be done more quickly and with less expense than by any other means.

Appended are extracts from two papers presented at the advertising sessions at the Salt Lake meeting of the Business Development Section, as follows:

"Selling Better Light—Better Sight", Walter E. Potter, Incandescent Lamp Dept. of General Electric Co.

"Rural Electrification Advertising", Harvey Leach, Puget Sound Power & Light Co.

Selling Better Light

By WALTER E. POTTER
Incandescent Lamp Dept., General Electric Co.

IN THE Better Light—Better Sight activity we have a universal sales appeal to every customer on our lines and throughout the world. Light is part of that external triangle of seeing, so essential there is no substitute for light, and we have the safest, cheapest, most accessible and reliable light available today.

Let us not overlook the many organizations helping to carry our banner in this Better Light—Better Sight activity —the eyesight specialists, school authorities, paint and varnish groups and others. As we help them through our advertising and sales promotion, they will help us sell not only more kw-hr. through better lighting, but assist us to sell the value of our service, and thus aid in combating the political propaganda directed against our industry.

National magazines in the residential, commercial and industrial field carry the theme of Better Light for Better Sight through advertisements of Mazda lamp manufacturers, portable lamp manufacturers and others. The advertising of the manufacturers of Mazda lamps has a vast coverage in our market, appealing to the buying motives of all customers. Many utilities are taking advantage of this advertising to tie-in with it locally through newspapers and other media.

In addition to the advertisements of manufacturers and others, many editorials and news articles appear in these magazines telling the story of Better Light for Better Sight. Every employee having anything to do with lighting should be supplied with a copy of each such current article written in magazines or newspapers. They should know what is featured and, when talking with customers, adroitly emphasize these points.

During the past year many utilities have featured cooperative pages on Better Light—Better Sight in local newspapers on several occasions. Why not plan to use this type of advertising regularly in our local papers. Consider for a moment, the automobile sections, the realty sections, appearing each Sunday in all large newspapers in our territory, each section filled with publicity along with a small amount of advertising. This material might be considered educational for the general public but certainly it is propaganda of the first water. With the great humanitarian angle we have in the Better Light—Better Sight story, coupled with the vast amount of direct advertising done by our utilities, there appears no reason why we should not have appearing regularly in our local papers articles of the type referred to.

It is suggested that in the preparation of our advertising we eliminate the use of scare copy, stressing the evils of poor lighting. Let us stress better light as an aid to better seeing, better comfort, better health and not as a cure-all for all seeing ailments.

In our educational copy let's talk about eyesight conservation but let's also feature charm, beauty, glamour, comfort and convenience. We have a new deal, a new style and a new trend. Good light enhances personal beauty, charm and glamour. Good light increases the beauty and charm of the home. Good light augments the pleasure, joy and happiness of home life.

Our educational copy may or may not directly make appointments for our lighting advisors in the home, but we know definitely that it does break down consumer resistance to the program, creating customer interest and desire which opens the door more readily when the advisor call personally. In the low-use customer group the coupon advertising has actually obtained some appointments for demonstrations. Radio programs featuring actual home lighting cases have been used successfully by one utility. It is reported that requests for home lighting demonstrations from this source represent 75 per cent of the calls.

In our merchandise advertising we should (1) be definite. It is all right to tell the story of seeing, but after all the consumer wants to know just what to do to get good seeing conditions. (2) Without the light meter a merchandise advertisement lacks news value, authenticity and scientific background. (3) Illustrations of portables should be dramatized to show the new sales points. The new 3-lite lamps and other I. E. S. lamps have a whole set of new sales points. The ad should not only picture the lamp but tell why and how. (4) Feature the I. E. S. tag, and if desired, "Built to the specifications of the Illuminating Engineering Society and checked and tested by the Electrical Testing Laboratories". Vast sums have been spent nationally by I. E. S. lamp and Mazda lamp manufacturers advertising this tag. Let's use it consistently.

(5) Be careful about making exaggerated claims for lighting. Better light cannot cure everything from bunions to falling hair! In seeing, lighting is a major factor, but eye glasses and competent work by the eyesight specialist are extremely important.

Beauty and happiness as appeals are likely to be successful. Basic impulses to buy are aroused when appeal is made to the customer's personal desire to be more adequate, to attain romance, to hold on to life and security. Cheapness and low cost are important contributing factors particularly to men.

Today's advertisement can't waste time. It must catch the reader on the run—or miss him altogether. It must overcome his natural inertia in reading advertisements at all. Then it must compete for attention with the mass of other advertising whether that of direct competition or the wares of unrelated lines. It must compete next with his natural and lively interest in the swift running drama of world events, expert fiction, editorial comments, political controversy and news features.

To create an advertisement that holds its own in such brilliant company, to give it qualities of arresting reader interest, and news excitement that will win a hearing for our sales message, make it sing. There are three basic musts: (1) It must have a strong central selling idea that instantly arrests the self interest of the reader; (2) it must be given news; it must have drama, enticement and universal interest; (3) it must be molded into a final and compact form, with the central "reason-why" compressed into the swift language of immediate understanding.

The objective of the promotional and advertising program must be to present the results in an appealing and an attractive manner rather than to sell the equipment. It must sell the low cost at which all of the increased comforts, benefits, conveniences or profits may be secured, compared with other commodities which are in common use in every customer's premises. Every sales presentation must be geared to the advertising story, the emphasis must be placed on the same points at the same time, each must supplement and complement the other. This is the only manner in which advertising and promotional programs can be made to produce the best results.

The electric bulb is a small thing, but its brilliancy alone lets the world know what is done in the big power plant at the edge of the water. Intelligent advertising is the electric bulb of our industry. It lets 130,000,000 Americans know what is being done, where men are at work creating things that they want and need.

The New York American recently said, "The trained advertiser remembers always for the benefit of his client, that advertising is wasted unless it does all of five things always. It must be *seen, read, understood, believed* and *wanted*."

Rural Advertising

By HARVEY LEACH
Puget Sound Power & Light Co.

THE operations of my company extend into nineteen counties of western and central Washington. In this territory, we have built 5,524 miles of lines to serve over 176,000 customers. This rural territory is over 90 per cent electrified. Yet we find that some of the farmers still feel that rural electrification is a serious problem in western Washington.

This lack of realization on the part of the farm customers constitutes a very serious problem which cannot be dismissed by a shrug, and a statement that it should be obvious to anyone that such conclusions are incorrect. Some method must be devised to answer these questions. In our case, we very definitely attempt to do this. The chief medium used is radio, on which we spend about 10 per cent of our advertising budget. A large proportion of our radio time is devoted to programs with a special appeal to farmers.

Each week day at 7 a. m., we announce the produce market reports. This is done by the radio announcers, reading directly from the daily issue of the Northwest Produce News. The company enters the picture only in the announcement that the information is furnished through the courtesy of the Puget Sound Power & Light Co. We know these announcements are listened to from the frequent telephone calls we receive from some farmer or his wife calling our attention to errors in quotations. The errors frequently come about from the announcer quoting the prices to the retailer rather than the prices to the farmer, and sometimes the announcer, pressed for time, will omit the quotation on some item of farm produce. Also we receive many complimentary letters containing suggestions for improvement of the service.

Another program, which we consider very effective, dedicated especially to farmers, is arranged by John Scott, farm electrification engineer of the company. Mr. Scott broadcasts each Tuesday during the noon hour. His subject matter is not restricted entirely to farm electrification, but is on farming subjects generally, designed to help the farmer increase his income through correct methods, efficient operation, etc. The interview method is generally used, as for instance, interviewing Charles D. Gains, state seed inspector, on the treatment of seed potatoes; Dr. Kalkus, of the Western Washington Experiment Station at Puyallup, on the improvement of poultry; M. S. Grunder, noted agronomist of Western Washington, on seeding logged-off land. Other subjects include: milk fever in dairy cows, raising pigs, irrigating pastures, painting farm buildings, construction of farm buildings to withstand wind storms.

One of our most elaborate radio programs is the Greater Washington Hour, which is broadcast each Tuesday evening. This program is not of primary interest to the farmer, but it does have a very broad appeal to rural listeners. For many months the program was put on each week recognizing the various local Chambers of Commerce. A broadcast by a Chamber of Commerce in a rural town quite obviously would deal very largely with the rural life of the territory surrounding it. Many broadcasts were devoted to the poultry interests, dairy interests, fruit raising, etc. We have a rather effective gage on the public acceptance of this program, and it is significant that some very favorable publicity comes from the newspaper comments on the broadcasts.

The radio program we use for exploding fallacies regarding the utility industry is our Highlight Hour, given each Wednesday evening. This program features light, appealing music and a talk of from six to ten minutes on some problem which the company wishes to discuss with the radio audience. The topics are chosen from questions as they arise from week to week, and the talks are by S. P. MacFadden, vice-president in charge of sales. His messages cover such subjects as "Line Extension Policy," "Why Advertise," "Water Supply as it Affects Utility Operation," "Electric Rates—how to obtain lower rates by using more electricity," etc. When a land slide damaged one of our generating plants recently, Mr. MacFadden in his next

radio talk explained the conditions and was able to correct some misapprehensions regarding the extent of the damage and the effect on service. Every week the news columns are watched carefully and when fallacies appear in news stories, an answer is given in a fair, frank and non-controversial manner .

In addition to the programs briefly described previously, we sponsor a Home Service Program each Friday morning, which, although not primarily intended for farm wives, has been found to interest many farm people.

A large portion of our newspaper advertising for the past year or so has also been shaped with a definite appeal to the farmer. During 1936 this program was climaxed by a campaign of testimonial ads setting forth the experiences of rural customers in the use of our electric service. A series of ads was prepared expressly for the local newspapers in each county served by the company, and each ad featured testimonials from farmers of that county. The theme of this campaign was to point out the company's unusual low rates for rural electric service. These ads were released in sixteen daily newspapers and ninety-two weekly papers in the company's territory, over a period of about two months. The campaign was rather expensive, but it aroused a great deal of favorable comment.

Commercial and Industrial Sales Bureau†

Introductory Statement

AT the meeting of the Advisory Executive Council of the Section early in the year the Commercial and Industrial Sales Bureau was set up with four committees: (1) Industrial Power and Heating to consider all applications large and small in the industrial field including competitive power; (2) Commercial Cooking to follow up the activities commenced by the Commercial Cooking Conference in 1935; (3) Air Conditioning to consider chiefly ventilation of restaurants and kitchens; (4) Commercial and Industrial Lighting to cover all lighting applications in business and industry.

At the Salt Lake meeting of the section each of these committees held a conference at which assigned subjects were presented by one individual followed by round table discussion. The Industrial Power and Heating Committee was in session all of Friday morning, March 26. The Commercial Cooking and the Air Conditioning committees divided the time during the afternoon of Thursday, March 25. The Commercial and Industrial Lighting Committee met both Thursday afternoon and Friday morning, considering industrial lighting and highway lighting during the first session and commercial lighting during the second session.

The reports of all these committees were presented by their chairmen to the general session of the section meeting on Saturday morning, March 27. These reports and extracts of some of the papers presented at the committee sessions are published in the following pages.

† A. K. Gaylord, Portland General Electric Co., Chairman; A. H. Wegner, The Washington Water Power Co., Vice-chairman; Chairman, Commercial Cooking Committee, C. T. Bakeman, Puget Sound Power & Light Co.; Chairman, Air Conditioning Committee, J. E. Yates, Pacific Power & Light Co.; Chairman, Commercial and Industrial Lighting Committee, G. B. Bocarde, Pacific Power & Light Co.; Chairman, Industrial Power and Heating Committee, George Ellerbeck, Utah Power & Light Co.

Industrial Power and Heating*

By GEORGE ELLERBECK
Utah Power & Light Co.

FIVE subjects of major importance in the industrial power and heating field featured the program of the Industrial Power and Heating Committee at the Salt Lake meeting of the Business Development Section. The substance of the following papers by members of the committee has been consolidated into this report:

1. Organization of Power Sales Activities and Selling Procedure, by G. A. Howarth, Utah Power and Light Co.

2. Selling the Small Consumption Power User, by O. C. Mayer, Idaho Power Co.

3. Electric Service as a Factor in Large Industrial Operations, by J. A. Hale, Utah Power & Light Co.

4. New Developments of Small Applications of Electric Heating in Industry, by D. Y. Robinson, Montgomery Bros.

5. Internal Combustion Engine Competition, by Arthur Greisser, Portland General Electric Co.

The development of additional electric loads among the customers of those central station companies comprising the Northwest Electric Light and Power Association are dependent upon many factors. It is the purpose of this report to discuss briefly some of them.

1. *Industrial Trends* — Unquestionably natural forces of recovery are now combining with artificial stimulation to produce exceptionally vigorous business activity both nationally and locally.

Were we to analyze every industry in the territories served by our Northwest companies we would undoubtedly find that price margins are increasing and that production is being stepped up to higher levels than we have seen since the boom years. With all industry expanding production, and at the same time being faced with serious labor problems, there will be undoubtedly a very definite trend toward mechanization. Certainly under these conditions the time is ripe for central stations to expend every effort to secure their share of industry's operating dollar.

2. *Possibilities for Increased Industrial Revenue.*—There are two general classes of new business that we may hope to secure: (1) new industries; and (2) more service to present industrial users.

Many factors govern the location of industry and much thought and consideration has been given to that subject. An industry may either locate near its source of raw materials or near the market for its finished product depending upon certain other conditions, chiefly water supply and transportation. Obviously any region that hopes to induce industry to come to it, will do well to

* George Ellerbeck, Utah Power & Light Co., Chairman; Idaho Power Co., O. C. Mayer; Montgomery Bros., D. Y. Robinson; Portland General Electric Co., A. H. Greisser; Utah Power & Light Co., J .A. Hale, G. A. Howarth.

indicate a plentiful supply of high grade water. Certainly it was an abundant water supply and proximity to raw materials that has caused the paper industry to become firmly established in the Northwest states. Quantity and quality of water supplies are of vital importance to pulp and paper manufacture. Requirements ranging from 50,000 to 100,000 gal. per ton of pulp and from 30,000 to 40,000 gal. per ton for all grades of paper are required. Disposal of waste is important in paper plant location, frequently causing their location on rivers.

We find transportation an equally important factor. It is possible to ship from Columbia River points to Detroit for less than $3 per ton. The fact that import tonnage entering the Columbia River is only 10 per cent of the export tonnage, resulting in empty cargo space on incoming vessels, indicates the possibility of favorable freight rates on incoming raw materials and consequently greater industrial development in that region.

Thus transportation and water supply are both key factors in the future industrial development of this region and it is quite impossible to over-emphasize their importance.

Much has been written about our national resources and stores of raw materials and their development if cheap power were available. This would place power as a prime factor in the location of an industrial plant. If such were the case it would be a unique condition, for in a survey a few years ago of some 10,000 industries in more than 1,900 cities in the United States and 150 cities in Canada, the most important factors in plant location were found to be (1) market, (2) labor and (3) transportation. It is obvious that power can be only an incidental factor in the majority of cases in the location of industrial plants, for the reason that power costs less than 1 per cent of the combined value of all manufactured products, a little more than 1 per cent of the cost of all materials, and about 3 per cent of the labor payroll. Its average cost for all industries in the United States is only 1.27 per kw.-hr. In the territory served by the companies of this association the average is less than this amount and is available under certain conditions of high load factor and large hp. demands as low as one-half cent per kw.-hr.

It seems unreasonable therefore to suppose that we can attract any industries to our territory by reason of the cheapness of the power service we render. We may look forward to a natural expansion of industries, but our revenues probably will not be built largely from this source. Large blocks of power sold at low prices per kw.-hr. frequently are not as profitable to utilities as small blocks of power at a higher rate. If we in this territory could sell all the kw.-hr. now generated and sold in large blocks at less than 1c per kw.-hr. to small industries at 3 or 4c per kw.-hr. we would find the industrial end of our business far more profitable today.

For this reason we believe that our greatest possibilities in the profitable promotion of electric service in industry are among the large number of small customers now buying our service in limited quantities. The smaller the industry the more important becomes labor as a production cost. Hence any additional use of power costing only a fraction of equivalent labor has much appeal to small industry.

3. *Organization of Power Sales Activity and Selling Procedure.*—The art of selling probably requires the highest degree of organization of any profession. Before any selling activity can be injected, a thorough market analysis must be made. In the case of the industrial market probably a reasonable first step should be a complete classification of customers to see the relative size of the different industries and number of customers, present or prospective, involved. Some companies have already so organized their industrial activity and have found this very desirable information. Every salesman should be constantly advised of the status of every customer as a prospect.

Any commodity or service that is not bought "off the shelf" but that must be sold, necessitates a prospect list. Our service to industry must be sold; it is not demanded by industry and has not yet achieved universal consumer acceptance. For this reason it is vital that we have a prospect list and a complete one. A prospect list must be both comprehensive and selective. Both present and potential customers must be considered from the standpoint of the relative chance for immediate sale. This will facilitate the allocation of the salesman's time in the most effective manner.

We suggest the use of forms comprising customer lists in the hands of every salesman, which will constantly keep before him the above information.

The selling job as applied to the industrial market might be considered as three-fold, (a) selling ourselves, (b) selling our company, and (c) selling the company's commodity. All of these phases are related and in no case can a satisfactory sale be consummated until all three of these conditions have been satisfied.

a. Customer confidence in the individual is paramount. Different individuals may have different methods of gaining this confidence, but always it is the outgrowth of the qualities of personality, knowledge, enthusiasm, and imagination on the part of the individual. We are dealing with people of intelligence and we must do so with all the intelligence at our command.

b. We learn from personal experience that we enjoy dealing only with business institutions that we understand and like. Why do we purchase our clothing, our food, where we do? Why do we choose the banking facilities that we do? Why do we purchase insurance from this company and not from that? Something has directed our attention in each case and our purchases have resulted from an understanding of the principles, policies and methods of the institution with whom we do business.

In a like manner we find our customer will desire to do business with us only after he understands our business principles, policies and methods. To accomplish this task we, as sales representatives, must have a thorough knowledge of our business, that we may clear up any misunderstandings on the customer's part.

c. Our success in the field of selling our company's commodity will be dependent upon the ability to recognize a need on the customer's part, and our knowledge of the application in question.

The former is the result of an exhaustive study of the customer's operations. The average industrial operator considers in one category his lighting, heating and power expenses and therefore a study of these three phases of his business must be made before a full selling job can be done. Such a study can, and should in many instances, result in a written power report being submitted to the customer. This must be comprehensive and analytical of his problems, their solution, and our recommendations to effect economies in present operation as well as intelligent suggestions for further use of electricity.

We are selling an important service to industry not a kw.-hr. The kw.-hr. is merely a convenient measurement, and the rate a convenient way of evaluating that service. For this reason we must always sell the application—what it will do for the customer, and its cost compared to the value or economy of this service.

4. *Selling the Small Consumption Power User.*—Inasmuch as the low use customer in the industrial field makes up in every case the majority of our total customers, we believe that some accurate method of recording and following prospects should be adopted, so that the salesman will always have some specific subject to discuss with his customer. The salesman must take a real interest in his customer's problem and find ways and means of being help-

ful without becoming a nuisance. His imagination must be working every minute of the time he spends in the presence of a customer or considering that customer's problems. What would he do if that customer's business were his to operate and manage? He must know his customer and his customer's business.

It is essential that the industrial representative present to his customer some new idea or constructive suggestion on each call. If not the time of both is wasted. Too often, especially if the call is not considered and planned in advance, periodical contacts may degenerate into a mere friendly visit with a discussion confined to generalities not pertinent to our mutual interests, and not constructive.

Our purpose is to make the small industrial customer larger. We must not lose sight of the fact that the success of our industrial sales program is directly dependent upon the financial success of the industrial operator who buys our service.

5. *Industrial Electric Heating*—There are many prospects for a variety of electric heating applications. These include cooking, baking, water heating and heating for a vast number of industrial processes. Early progress in the electric heating field was retarded by high power cost, low fuel prices and lack of suitable apparatus to which it could be applied. These handicaps have gradually been overcome and today we are in a position to compete with other fuels from the standpoint of economy and efficiency. Our success in the field of selling this type of electrical use will depend upon our ability to seek applications for this service in every customer's premises and to be able to solve his present heating problems by electrical methods. Again selling is the answer.

6. *Internal Combustion Engine Competition.*—Operating as we do in a territory where relatively cheap natural gas, fuel oil and other types of energy are available, at least in the urban communities and the more highly industrialized centers, we may expect an increased effort on the part of competitive machinery salesmen.

To meet the competition of internal combustion engines successfully, the power sales engineer requires complete knowledge of the engine, correct analysis, and first class salesmanship. He must be thoroughly conversant with his competitor's product, costs, and sales tactics. Adequate exhibits, facts and reports must be utilized with a full understanding of customer psychology.

However, with the constant downward trend of central station power costs, with the development of interconnected and network systems, with the inherent convenience, reliability, and flexibility of central station service, coupled with freedom from power plant investment, fuel supply, labor supervision and maintenance, it is extremely doubtful if there is any justification, economic or otherwise, for the installation of internal combustion engines in direct competition with central station service.

It is well for industrial representatives to keep thoroughly in mind at all times the collateral advantages of our service as applied to every industry.

The successful power salesman is one who everlastingly sells his own service. Where through consistent, planned contacts he has sold the advantages of our service, and has made certain through tests that the customer's use of utility service is as efficient as possible, the chances for competitive inroads are very small.

If, on the other hand, our representative has stayed away from a customer's plant and let his competitor's salesmen do the selling, and afterwards has rushed in to knock the competitor's proposition, he is unlikely to gain the customer's confidence. Everlastingly selling both the tangible and intangible value of our service will prevent such a situation.

Our problem is one of so completely obtaining the confidence of our customers that such a threat cannot arise without our knowledge. We must be in a position, through early knowledge of dissatisfaction with the quality or economy of our service on the part of any customer to make a full analysis of the situation before our customer is exposed to the high pressure arguments of competition. Once lost, a customer is extremely hard to regain.

It is our belief that ahead of us lies the greatest opportunity in many years for the enhancement of our revenues from industrial uses of our service. This goal can be attained only through well organized, consistent hard work on the part of all those concerned directly or indirectly with industrial sales.

As a part of his paper on electric service in large industrial operations, Mr. Hale briefly described the use of central station service made by the Utah Copper Co. This part of his paper is appended.

Central Station Electric Service in Utah

By J. A. HALE
Utah Power & Light Co.

THE Utah Copper Co. mine is located in Bingham Canyon, 25 miles southwest of Salt Lake City. The ore requires concentrating before smelting, and this is done at two large mills 15 miles north of Bingham known as the Magna and Arthur plants. The ore deposits are enormous porphyry beds or intrusions in the mountain mass between the main canyon at Bingham and a tributary canyon known as Carr Fork. The ore beds are covered by 100 ft. or more of overburden, which has to be stripped off and hauled to waste dumps. The copper content of this ore is below 1 per cent and therefore the tonnage of ore is great and all handling, hauling and milling operations must necessarily be on a large scale.

The mine is a large open pit covering several hundred acres, the working face extending up the mountain slope bench by bench for thousands of feet. The ore which exists in solid formation requires blasting. It must be loaded into cars, and the mining operation also includes assembly of loaded cars into trains for transportation by steam railroad to the mills 15 miles away.

At the mills the ore must be crushed and ground to extreme fineness before it can be concentrated. This requires large primary crushers receiving ore as it is dumped out of railroad cars, and batteries of secondary crushers. It then has to be further reduced by batteries of roll and ball mills.

After having been ground to extreme fineness concentration is effected by the flotation process. Literally hundreds of flotation cells are used each requiring mechanical agitation. The product of the flotation process is copper concentrate bearing about 25 per cent copper, which goes to the smelter. The waste or tailings goes to the tailings dump covering hundreds of acres.

Here is a case, as in many others, where the location of the industry has not been determined by proximity to power developments. The location of the mine was of course fixed by nature and the mills had to be at the point where ore and water for milling could be economically brought together, and where land was available for tailings dumps. In this case electric power has not only been brought to the industry but has found its way to practically every detail of every operation and process and has brought about that

simplicity and absence of complication which is so typical of well organized industry.

The energy is entirely furnished by the Utah Power & Light Co. It is produced at widely separated generating stations and brought by transmission lines to the Terminal substation six miles west of Salt Lake City.

The 130,000-volt transmission lines owned by the Utah Copper Co. receive the energy at Terminal and transmit it 14 miles west to Magna, where the principal substation of the copper company is located. The Magna Central Substation, as it is called, steps the voltage down to 44,000 for distribution to the mine and the two large mills, the Magna mill and the Arthur mill. This substation has two 25,000-kva. transformer banks for the mills and a 12,000-kva. bank for the mine, making a total capacity of 62,000 kva.

There is a 44,000-volt double circuit line also owned by the copper company extending from the Central Substation 14 miles south to the mine in Bingham Canyon, and short 44-kv. lines connect each of the mills with the Central Substation.

At Bingham 44-kv. lines extend as closely as possible to the mining area, where substations are located for again reducing the voltage. For electric shovel operation there are two substations each with six 400-kva. transformers stepping down from 44,000 volts to 5,000 volts. Duplicate trunk lines extend from these substations completely encircling the mining area and distributing power to the various levels where the 25 electric shovels are loading ore.

In addition there is also installed at the mine, haulage system reduction and conversion equipment of a total capacity of 8,000 kw. for supplying the 39 electric locomotives that are operated.

Each of the large concentrating plants at Magna and Arthur has two substations stepping down from 44,000 volts to 440, which is the voltage used by the motors driving the equipment in the mills. One of the substations in each case is used for the upper part of the mill where the heavy equipment is located, such as the primary and secondary crushers, rolls and ball mills, and in each case the other substation is used for the lower part of the mill where the flotation equipment is located.

The following list of motors used in the mills will give a conception of how directly electric power has been applied to mill equipment:

	Motors		Connected
Arthur Plant:	**No.**	**Hp.**	**Hp.**
Car Dumper	2	162.5	325
Primary Crushers	1	300	300
Conveyors	2	125	250
Secondary Crushers	3	250	750
Roll Sections	13	300	3,900
Elevators	13	75	975
Elevators	13	50	650
Ball Mills			
Primary Mills	13	200	2,600
Secondary Mills	39	200	7,800
Drag Classifiers	78	10	780
Flotation Section	486	10	4,860
Molybdenum Section	75	10	750
Cleaner Plant	88	10	880
Compressors	2	275	550
Pumps	1	350	350
	1	600	600
	4	200	800
Filters	6	var.	75
Shops and Foundry	66	var.	700
Total Connected Load			27,395
Magna Plant:			
Car Dumper	2	75	150
Primary Crusher	1		250
Conveyor	2	125	250
Secondary Crushers	3	200	600
Roll Sections	12	450	5,400
Elevators	12	50	600
Ball Mill Grinding			
Primary Mills	24	200	4,800
Secondary Mills	36	150	5,400
Classifiers	72	10	7 20
Flotation Sections	616	10	6,160
Compressors	3	var.	600
Pumps	2	850	1,700
Lime Plant	1	750	750
	9	200	1,800
	12	var.	410
Filter Plant	5	var.	50
Shops	40	var.	350
Total Connected Load			29,990

If the motors used at the mine and for auxiliary operations are added to those listed for the mills, it brings the total number up to 1,900 individual motors and the rated capacity up to 120,000 hp.

Probably no more outstanding example can be found to illustrate how electric service accomplishes just that simplicity and saving of wastes that is needed to make industry successful.

Commercial Cooking Report*

By C. T. BAKEMAN
Puget Sound Power & Light Co.

BEFORE reporting for this committee, I want to express my appreciation of the splendid work of the committee members, each of whom gave an outstanding contribution to the progress of commercial cooking and baking sales in their respective territories. I cannot hope to give you a complete picture, in the space available, of the work that was presented in the two hours of rapid-fire conference that had back of it weeks and months of careful preparation. In giving you a quick picture of this work, I would like to bring before you three major points:

1. Value of these conferences in developing a more effective sales technique and solid selling front.
2. The value of this commercial load, what its possibilities are, and what we need to do now.
3. Need for industrial and commercial installation data sheets to be exchanged through the association.

I believe that the committee conference had a distinct advantage in this convention because of the previous work of two mid-season conferences which formed a foundation for our work. These were attended by the men actually doing the job and the programs were designed to be of help to these men.

Another distinctive feature was that there were no long winded papers to be taken home and later filed after we had given up an attempt to read all of them. The meat of the work of each committee member was boiled down into standardized data sheets that could be taken home, distributed to each salesman on the job and used by that salesman every day. We are giving you this picture because we believe that this type of work has a definite place in the Association's activity.

The subject of successful sales methods and results, ably handled by Carl Hoffman, of The Washington Water Power Co., naturally divides itself into the following subjects: What are we getting in this commercial cooking field? What is this load worth to us? What should we be getting from this prospective market? How should we go about getting more of our share of it?

A conservative summary of the member company reports of 1936 shows a total of 8,000 kw. added, representing annual revenue of $200,000. This does not include two of the companies from which we were unable to get reports in time and it covers only the sales by power company representatives, and does not include sales made by dealers and jobbers independent of the company activity.

Sticking to the conservative figure, this 8,000 kw. is equivalent to the revenue of approximately 8,000 domestic ranges. While this is not a large figure for the Northwestern states, it would be quite a sizeable job for any one of these companies and any company selling 8,000 domestic ranges a year, with

* C. T. Bakeman, Puget Sound Power & Light Co., Chairman; Idaho Power Co., O. C. Mayer. W. R. Reed; Northwestern Electric Co., D. O. Bergey, U. K. Petersen; Pacific Power & Light Co., J. E. Yates; Utah Power & Light Co., J. H. Shaw; The Washington Water Power Co., Carl L .Hoffman, Magnus R. Lund.

less than 16 salesmen, would have something to brag about. This 8,000 kw. of commercial load was added through the equivalent efforts of approximately 16 full time salesmen. The obvious answer is that this commercial load can be obtained at a very low selling cost.

This commercial load is also inexpensive to serve. Customers make extensive use of every kw. of demand they impose, averaging close to 2,000 hours per year. Most of this use is off peak and the amount of demand on peak is considerably less than the full demand. Most of this load is added in congested areas where adequate distribution and transformer capacity are readily available. This makes for a minimum cost of connection, which, when we consider the rising cost of labor and material, is becoming a more and more important feature. It means more and quicker net revenue added.

This commercial cooking load is also a dependable load. Much has been said about the dependability of our domestic load and everyone recognizes the advantage of building the loads that are not subject to sudden losses through changing economic conditions. Dependability of our domestic cooking load rests on the foundation that we all have to eat regardless of economic conditions and I wish to propose that this commercial cooking load is as dependable as the American appetite.

The next question is, how much of this very desirable prospective business should we be adding to our lines? I do not know of any accurate survey of the possibilities of this load in this territory. Certainly a survey of this kind would be valuable. We should know what the possibilities are. National surveys indicate that the market for this load is equal to the domestic range market in urban communities. If this is so, we have a total market in the Northwest for 400,000 kw., representing, approximately, $10,000,000 annual revenue. During 1936 we only obtained 2 per cent of this total market. That is not enough. Because of the rapid change in this business, there is, approximately, $1,000,000, or 10 per cent open for competition each year without consideration of the new business and the growth.

We should be getting more of this profitable business. To get more of it we need more salesmen. *To balance this load building activity with the domestic sales program, an average company should have at least one full time commercial cooking salesman to every five domestic salesmen.* There is a definite need for better equipment and training for the salesmen in this field. They are faced with many varied and complex problems and need accurate experience data and a definite selling technique to help them get the maximum results. This committee has endeavored to work out some of these problems and company executives should give serious consideration to this need.

There is, further, need for advertising support to help sell the advantages and real economy of the "electric way." Most advertising available through manufacturers is equipment advertising and there is no national program such as the "Better Light—Better Sight" program to develop the superiority of electrical service over other types of fuel services available. Directional advertising such as trade journal publicity and advertising, direct mail programs, together with newspaper publicity on new electric installations, offer an opportunity for the utility to sell the use of electric service. An excellent direct mail series, based on user testimonial letters, was shown to illustrate what could be done.

One of the greatest needs of this commercial cooking activity is adequate executive appreciation and support. Without this, commercial cooking salesmen cannot possibly do the job they should do.

Sample data sheet on commercial and industrial competitive installations

Commercial Cooking and Baking
Section .....
Sheet No. .....
Date .....

COMMERCIAL AND INDUSTRIAL DATA SHEET
Northwest Electric Light & Power Association
SUBJECT: MAINTENANCE COST OF COMPETITIVE FUEL EQUIPMENT

SEATTLE COLLEGE
2440 Interlaken Blvd.

Date of installation: May 2, 1934.
Type of equipment installed: One Lang No. 130 Heavy Duty Range—24.0 kw.
Average yearly maintenance cost from May 2, 1934 to date: None (No repair service required).
Type of equipment replaced: One Lang Heavy Duty Oil range (Diesel Oil Fired).
Customer reports average yearly maintenance cost of oil fired equipment: $50.00.

MEADOWS SANATORIUM
The Meadows

Date of installation: August 13, 1936.
Type of equipment installed: One Lang Heavy duty electric range.
Repairs to date: None.
Type of equipment replaced: One Lang Heavy Duty Oil range (Diesel Oil Fired).
Customer reports average yearly maintenance cost of oil fired equipment: $40.00 (Cooking top of oil range replaced every 18 months at a cost of $60.00).

MARINE HOSPITAL
14th South and Judkins St.

On January 15, 1933, the Builder's Sheet Metal Works of Seattle installed four Wrought Iron Gas Range Company ranges at the Marine Hospital. On March 1, 1937, these ranges were completely replaced with four new Magic Gas Ranges by the Seattle Gas Company. It is reported that the old ranges were replaced because they were broken down and no longer in workable condition.

THE "GOODIE GARDEN" CAFE
Montesano, Washington

Four-plate Edison cooking top in service seven years with no plate repairs nor maintenance costs during the period. Restaurant open approximately 12 hours per day, continuously, during the period. Cooking top used for pan work exclusively and supplemented by Edison Grill during last several years.

Prepared by JACK DUGAN and
C. T. BAKEMAN.

D. O. Bergey's report on load characteristics of commercial equipment was an excellent job, which involved a great deal of preparatory work and will prove invaluable to future progress. This study thoroughly analyzing eight typical installations, gives us information never developed before. It tells a great deal about the value of this load. From it a new and accurate technique for estimating operating costs and load requirements was developed. It is a start of a study to develop wiring requirements which will reduce installation costs. Information of this report was boiled down in concrete form on standardized data sheets that your salesman can use every day.

J. E. Yates presented a splendid report on the investigation of hot water requirements in restaurants. This is a subject on which there has been very little previous information and the results of this study will be extremely useful. This will be helpful in estimating hot water requirements for restaurants and determining the application of off peak installations, and in estimating customers' operating costs. This information was boiled down to standardized data sheets and will be helpful to salesmen in their everyday work.

O. C. Mayer, in reporting on competitive fuel equipment, presented an effective method of analyzing competitive costs. Using an actual case where a customer was planning to change to oil, he showed how additional serviceability, advantages and economies of electric service could be brought in. A number of actual installations, where electricity had replaced competitive fuel, were presented with actual customer maintenance costs of this competitive fuel. This information was boiled down to standardized data sheets, which will be helpful in selling electric service over competitive fuel service. A sample of these data sheets is appended.

Referring to electric equipment developed, I merely want to say that we now have modern, effective and economical electrical equipment to meet every commercial cooking need. Modern commercial equipment is as different from the old equipment as the modern domestic range is different from the first home ranges developed. Much of this development has been pioneered in the Northwest and many of the improvements are a direct result of previous conferences of the men who have been selling this electrical idea in the Northwest. We are now able not only to meet competitive fuel costs in most cases, we can also show superior operation, convenience, improved product, longer life, and lower maintenance costs.

"Ask the Man Who Owns One" is probably the best known and most enduring slogan in the history of American business. The committee is indebted to the Utah Power and Light Co. for making it possible to hear from Mr. Gloss, who owns two completely electrified restaurants in Salt Lake City. I know of no better testimony, that proves the advantages and economies of electric cooking in the restaurant and that proves the friendship value of properly selling the commercial cooking service than the story Mr. Gloss told. I only wish that all of the company executives could have heard this talk.

You may have noticed that practically all of this committee's work was boiled down into useable standardized data sheets. There is a very definite need for more of this type of information for the commercial cooking men. In fact, this need exists in the entire industrial and commercial field where salesmen are confronted by many varied and complex problems.

This need is not adequately met by catalogs and literature of which there is an ample supply available. What we need is more accurate information and experience data on local installations. Companies are recognizing this need by developing commercial and industrial sales manuals. However, these sales manuals depend on the limited experience data in the companies' own territories or on information prepared in Eastern centers, which do not apply generally to this territory. The cost of preparing a sales manual for a relatively small group of men that will be effective and convincing to customers is relatively high and this has held back progress generally. Information that is helpful to commercial and industrial salesmen in one company is generally helpful to salesmen of all of the companies of our group.

This offers a real opportunity for the association to fill a definite need of its member companies. The American Gas Association, for a good many years, has filled this need. I have four loose-leaf note books containing gas installation data sheets covering every conceivable use of gas heat. The Southwestern Light and Power Association is providing its members with a commercial and industrial data sheet service. They are stimulating this activity by offering a $5.00 reward, together with a loose-leaf binder for every acceptable data sheet submitted. In addition, for 1937, $75 of prizes are offered for outstanding contributions.

Our Northwest Association should take the lead and develop a similar service. Your Commercial and Industrial Bureau conference voted unanimously to present such a plan to the association's officers. A committee has been appointed and we hope to have definite recommendations in the hands of the association Executive Committee in a short time.

Commercial and Industrial Lighting Report*

COMMERCIAL lighting, one of the oldest commercial services the electric utility company has to offer its customers, seems to be losing prestige as against those newer services — commercial cooking, refrigeration, and air conditioning. All are important phases of load building but if lighting is to maintain the position it has enjoyed during the past years, greater emphasis must be given to it in all utility load building activities.

By G. B. BOCARDE
Pacific Power & Light Co.

Approximate figures show that lighting quotas for the major utility companies in the Northwest will equal $944,800 in estimated annual revenue in 1937. During 1936 some $800,000 in estimated annual revenue was reported by the same group of companies. Considering the 1937 quotas in terms of the major domestic appliances, we have approximately 31,500 electric water heaters or 63,000 refrigerators. A program of such scope would create tremendous interest in the domestic appliance field. Commercial lighting, therefore, deserves support equal to its equivalent domestic appliance program. It is an activity that surveys indicate can be obtained for an expenditure of from 10 to 50 cents per dollar of estimated annual revenue. Various surveys made among member companies show that in metropolitan areas $63 to $66 in revenue per kw. of connected commercial lighting load can be obtained. Is that not profitable load?

Considerable discussion of late has questioned the value of commercial lighting load due to its relation to system load peaks. Preliminary surveys by one member company, and since these surveys are in the preliminary stage they cannot be taken as conclusive, indicate that while commercial lighting does tend to build up the system peak in many cases, the commercial lighting peak is not identical with the system peak. It was brought out in committee discussion that the problem is one for further study and consideration, but from the facts so far adduced commercial lighting load building should not be curtailed on this account. All member companies today are still connecting as much additional commercial lighting load as possible.

For successful commercial lighting activities the program must be built around the sales organization. Discussion on this topic brought out that today in many companies the "all-service" program has taken the place of the specialized program on lighting formerly carried on. This change of organization came about due to a number of advantages which are believed obtainable through an all-service program, a few of which can be summarized as follows: (1) More complete customer coverage, (2) greater economy, (3) easier sales direction, (4) saves customer's time, (5) more personalized consulting service, (6) makes repeat calls easier, (7) facilitates handling customer complaints, (8) eliminates "passing the buck", (9) better customer relations, and (10) more sales are made.

The "all-service" commercial salesman can in many cases be a specialist, not in the type of service a company has to offer but in the business of the customers he is calling on. In this light, one salesman would specialize on food stores, another the automotive industry. In such a manner he becomes familiar with the needs of his customers and the many applications for electric service that can be applied to the specific type of business.

The "all service" salesman must have adequate training, technical assistance at all times and complete supervision. Because of the many services a salesman of this type must keep in mind, an intensive training program is fundamental. The "all service" program is new and may have numerous problems. As the discussion revealed, it should be given careful consideration and watched during the ensuing years.

---

* G. B. Bocarde, Pacific Power & Light Co., Chairman; B. C. Electric Railway Co., R. Hall; The California Oregon Power Co., Allen Smith; Idaho Power Co., O. C. Mayer; Incandescent Lamp Dept. General Electric Co., Walter E. Potter; The Montana Power Co., Dean McGonigle; Northwestern Electric Co., M. S. Glenn; Portland General Electric Co., T. W. Fitch; Puget Sound Power & Light Co., Paul Marble; Utah Power & Light Co., J. H. Shaw; The Washington Water Power Co., Ladner V. Ross.

Last but not least, consideration of various sales methods is of utmost importance in any commercial lighting organization. General discussion revealed that most companies use the following methods: (1) Plans and specifications, (2) direct mail advertising, (3) demonstration, (4) visual and testimonial proof, (5) see the people, and (6) customer surveys.

"See the people" while being listed as only one method should be the one basic sales method practiced by all companies and individuals. Sales cannot be made without "seeing the people".

School lighting, a vital problem today, was given careful consideration in committee discussion. Conclusions were that while school lighting may be somewhat low as a source of revenue, the great benefits of adequate artificial illumination without glare in the classroom as a means of combating the increase in defective vision among children justified the time and effort in promoting modern school lighting. School lighting today can be a somewhat more profitable source of revenue through the use of photo-cell control. Such a method of operation assists in having the artificial illumination on when necessary rather than leaving the matter up to some individual. Throughout the Northwest this method of control has been gaining favor during the past few years and has been meeting with unusual success. The problem of school lighting continues to be one of education of school officials to the necessity of adequate illumination through personal calls and other promotional efforts.

Street and highway lighting, an important part of the national safety program, warranted considerable committee discussion. The question as to the value of promoting street and highway lighting has often been presented. Rates for the most part are such that the revenue per dollar of investment is quite low; additional street and highway lighting increases the cost of government and in many cases fosters the possibility of competition. Today it is true we find the rate of return from street lighting to be low, but only because we have not sold this lighting in adequate volume. The cost of government has increased without additional expenditures for street and highway lighting and competition is here. Therefore, there seems to be no valid reason for not promoting adequate lighting of streets and highways.

During the past few years there has been a growing movement for greater safety on our streets and highways. It is a movement similar to many others having a humanitarian background. When one considers that each week there are over 700 fatal accidents in the United States, many of which are in the evening, it behooves us to consider the vast need of adequate street and highway lighting. The recent school house disaster in Texas was a great shock to the entire nation but think of over 700 fatal accidents each week. Is it not worthwhile to try to reduce this accident toll?

An anaysis of the situation reveals that selling safety lighting up to the minimum I. E. S. code requirements would (1) Increase the number of units approximately 2½ times; (2) increase the street lighting kw.-hr. sold, approximately 4 times; (3) increase the effective illumination approximately 10 times; (4) increase street lighting costs less than 2 times; and (5) give immeasurable improvement in visibility, and greatly reduce accident costs.

The need for safety lighting on streets and highways is established. New and more efficient luminaires have been developed, such as, the deep-bowl inclosing glass luminaires, the high-visibility luminaires, the radial-bowl reflectors and sodium vapor units. The time seems right for a comprehensive promotional and sales plan to equip all streets and major highways with safety lighting.

Other committee topics during the last two days included demonstrations and discussions of modern light sources and luminaires. A discussion of that controversial subject—totally indirect, semi-indirect or direct light for merchandising—drew out much debate, and as yet we do not have any entirely satisfactory conclusions. Modern applications of architectural lighting were discussed and installation methods demonstrated. Successful sales promotion methods for this type of illumination again are centered around "see the people".

In conclusion, let us not forget the part that commercial lighting plays in our load building activities. The market is waiting; luminaires of every type and description are now available; we have a definite objective; so if everyone will heed the call there is little doubt that the 31,500 water heaters in terms of commercial lighting revenue will be sold in 1937.

Extracts from two papers presented at the committee conference are appended to elaborate important points. They are:

"Street and Highway Lighting for Safety," by C. T. Bakeman, and

"The Utility Lighting Sales Organization," by J. Homer Shaw.

The Utility Lighting Sales Organization

By J. HOMER SHAW
Utah Power & Light Co.

THIS discussion covers the "All Commercial Service Salesman vs. the Lighting Specialist". Prior to 1935 our sales organization consisted of lighting salesmen, heavy duty cooking and baking salesmen and power salesmen. After two years experience with the all service salesmen we are very well satisfied. During this period we have found many advantages in this set up and as far as I know, no important disadvantages. Because our men sell complete electric service, we have divided the sales into seven classifications for reporting sales, as shown in the accompanying Form.

Method of Reporting Commercial Sales:

	Inc. K.W.	Inc. Rec.
Commercial Lighting Sales		
Commercial Air Conditioning		
Commercial Refrigeration		
Commercial Cooking and Baking		
Commercial Water Heating		
Other Commercial Heating		
Misc. Commercial Power Sales		
Total Commercial Sales		

The revenue value per kw. for each of the preceding loads is determined at the general office and each division reports revenue sales on the same basis.

In the actual report filled out each month the classes of service are further broken down, for example, under the heading lighting is reported—window lighting, flood lighting, store lighting, etc.

We have found many advantages in the all-service commercial salesmen over the lighting specialists. These advantages are listed in the committee report.

Instead of having specialists for the different kinds of services we have to offer, our all-service salesmen specialize in the various types of businesses our customers are engaged in. In Salt Lake Division, for instance, we do not divide the territory up geographically for the different salesmen, but give each man a certain group or class of customers to call on. In this way he soon learns all the different classes of service this group of customers can use. In other words he specializes in the services his customers can use to advantage. He learns the customer's language; he knows his problems; and if there is a

trade association, he belongs to it and takes an active part in its activities and meetings.

Training Salesmen

When we grouped our customers for each salesman to call on we gave the heavy duty specialists those customers who had need for commercial cooking and the lighting specialists the balance. This made the start easier. We used the following methods of training salesmen:

1. Lighting courses by lamp manufacturers.
2. Lighting course by G. E. and LaSalle.
3. Selling helps on commercial cooking put out by manufacturers.
4. Study of catalogues and bulletins on refrigeration and air conditioning.
5. Commercial conference held in Salt Lake twice each year where all commercial salesmen attend, and technical information and sales helps on all classes of service are given.
6. Helps from general office field men who contact divisions each month.
7. Personal calls by representatives of manufacturers and jobbers on our commercial salesmen in all divisions.
8. Reading of all trade magazines on all the different classes of electric service.
9. Sales manual.

1—Each of our salesmen has completed a course on illumination put out by the Lamp Manufacturer. These courses give the fundamentals of illumination and contain enough information to equip a salesman to properly lay out any ordinary lighting job.

2—Our salesmen are right now studying the LaSalle course which teaches mainly how to sell commercial lighting.

3—The manufacturers of commercial cooking equipment put out booklets about their equipment and very good sales presentation stories as well as methods to use in figuring a job. If these are studied and applied they do much to train a salesman in commercial cooking selling.

4—Manufacturers of refrigeration and air conditioning equipment put out catalogues, bulletins and papers on these subjects and much can be learned by a study of them. You may say that air conditioning is a highly technical subject and one should be an air conditioning engineer to sell air conditioning. This might be true if one were selling the equipment on large jobs. But our salesmen sell this service only in a promotional way. Recently most of the mystery about air conditioning has been removed. In small jobs, say up to 10 tons, the manufacturers can offer practically a package article. In other words, in such jobs the engineering has been engineered out of air conditioning. All our salesmen need to know is what air conditioning consists of, the different phases and mostly have a good sales story on the advantages of air conditioning. If our men can intelligently explain air conditioning and convince a customer that he should have it, he will soon have many half sold prospects for the equipment salesmen to close.

5—At the Company's commercial sales conference the men are given sales activities and often manufacturers' agents are invited in to display their equipment and explain it and point out the sales advantages. Probably most of the salesmen's training is received at these conferences.

6—It is the duty of the general office field man to help the division salesmen solve their problems and work out their difficulties, as well as check over their different sales activities.

7—Manufacturer's agents and jobber's salesmen are continually traveling our territory and always call on our commercial salesmen and many new ideas and suggestions are received from them. They also tend to keep our men up to date on new equipment available.

8—Our salesmen are subscribers to various trade magazines and there is no question that they gain much knowledge from them.

9—The general office has prepared a sales manual for each class of service which is covered quite thoroughly and is added to from time to time.

Successful Selling Methods

Here are seven points on sales methods that have proved successful in our company.

1. On every important lighting job, a detail plan and recommendation is submitted to the customer. This recommendation not only contains the spacing, mounting height, foot candles, type of fixtures or suggestions on painting and decorating, but a sales story on the benefits of good lighting. Where considerable wiring is to be done a wiring specification is also included.

2. At different seasons of the year syndicated mailing pieces are sent out to a select list of customers, usually with a return card. These serve as a pre-approach and the salesman, of course, makes a personal call later.

3. One of the best known methods of selling is by demonstration. For instance each division has a telescope steel pole to be used for demonstrating flooding lighting to service stations and roadside inns, etc. They also have a Wakefield Commodore portable demonstrating fixture for store and office lighting.

4. Before and after pictures on good, local lighting jobs together with testimonial statements by the customer prove both interesting and effective proof of the advantages of good lighting.

5. One of the best methods of selling is to see the people. Anybody knows you cannot sell by spending your time in the office. So we say spend as much time as possible face to face with as many customers as possible.

6. Every salesman makes a continuous survey of each customer on his list. He has a printed survey form on which he marks down the customers present uses; which are adequate and which inadequate; what they need; and what they are prospects for.

7. One of the most successful promotional sales activities we have had is in the use of the Miniature Model Store Front, put out by the G. E. Company. At the present time it is traveling around the division. At the division the commercial salesman takes it to the various towns and shows it to group meetings, both clubs and special invitational meetings. He also has the film and record on "Three Second Selling", together with samples of building materials, such as structural glass and stainless steel. The idea is to promote modernizing in which illumination plays an important step.

Street and Highway Lighting for Safety

By C. T. BAKEMAN
Puget Sound Power & Light Co.

THE IDEA of safety street and highway lighting is already being sold. It is unnecessary and unwise for the local utility to embark on any high pressure program. Rather I believe that our most effective approach is through a cooperative service to state officials, county officials, city officials and other interested groups. Many organizations, including insurance companies, safety councils, civic organizations and automobile clubs are vitally concerned in this safety program. Knowing the facts of safety lighting, it is the utility's obligation to bring the facts to these groups. Once having these facts they will do more than the utility could possibly think of doing in educating the public to this safety need.

State, county and city officials are directly concerned with this safety problem. We in the utility business can render them an inestimable service by bringing to them these facts, the experiences of other states and other cities, that will help them meet this problem. One of the biggest needs in many states regarding safety is to know when, how and where accidents are occurring. Cooperative work with state departments and safety councils in outlining plans of accident records that will show this, automatically uncovers the need for safety lighting.

When the need for safety lighting is uncovered, the next problem is to have a definite plan to supply this need. Here is an opportunity for the utility company to offer a planning service that will help the state or city adequately to meet its safety lighting needs. Once the plan is developed it is usually necessary to convince the officials and people of the city or state of its soundness and merit. A demonstration installation is the most convincing proof.

Offering a planning service involves both street lighting standards and street lighting technique. There has been developed, through the Illuminating Engineering Society, both a code for safety street lighting and code for safety high-

Section .....
Sheet No. .....
Date .....

COMMERCIAL AND INDUSTRIAL DATA SHEETS
Northwest Electric Light & Power Association

SUBJECT—I. E. S. HIGHWAY LIGHTING CODE.

RECOMMENDATIONS FOR HIGHWAY LIGHTING—The following table sets forth the order of illumination intensity which should be produced on highways. In proportion as traffic density or speed upon highways of stated types is relatively great, the higher average intensities of illumination should be sought. Illustrative spacings and sizes of lamps fitting approximately into these recommendations are presented but other combinations of spacing and lamp size to provide the equivalent illumination may be preferable under some circumstances.

Highway and Street Lighting

	Pavement Width		
Pavement permanently light in color. Lumens upon pavement surface*	2 Lanes	3 Lanes	4 Lanes
	of the order of 0.2 to 0.5 lumen per sq. ft. delivered upon pavement surface.		
Illustrative Arrangements*			
Luminaire spacing, ft.	240-250	240-250	240-250
Mounting height, ft.	25-30	25-30	25-30
Lamp Lumens	6,000	6,000-10,000	6,000-10,000
Luminaire spacing, ft.	200	200	200
Mounting height, ft.	25	25	25
Lamp Lumens	6,000	6,000-10,000	6,000-10,000
Luminaire spacing, ft.	125	125	125
Mounting height, ft.	25	25	25
Lamp Lumens	4,000	4,000	6,000
Darker pavements, oil polished. Lumens upon pavement surface*	of the order of 0.3 to 1.0 lumen per sq. ft. delivered upon pavement surface.		
Dull black pavements. Lumens upon pavement surface*	of the order of 1.0 to 2.0 lumens per sq. ft. delivered upon pavement surface.		

* The illumination on the pavement surface which is here recommended may be obtained in a variety of ways, as by larger illuminants spaced more widely or smaller illuminants spaced more closely. Each example of spacing and lamp sizes illustrates one of several possible arrangements. The best selection of arrangements may vary with local circumstances. The illustrations given are based upon the more common pole spacings, but the growing tendency to separate the lighting poles from the rural line will free the lighting design from such restrictions.

Prepared by C. T. BAKEMAN,
Puget Sound Power & Light Company

Section .....
Sheet No. .....
Date .....

Highway and Street Lighting

COMMERCIAL AND INDUSTRIAL DATA SHEETS
Northwest Electric Light & Power Association

SUBJECT: SELLING SAFETY LIGHTING
ANALYSIS OF TYPICAL STREET LIGHTING SYSTEM

Series and Multiple	Present Overhead Street Lighting		Approximate* I. E. S. Code Requirements	
Up to 100 watts....	6,939	89%	9,200	45%
150 watts....	598	8%	7,160	35%
200-300 watts....	265	3%	4,080	20%
	7,802		20,440	

* Estimated on a very minimum basis with no provision for medium and heavy traffic code requirements.

1. Now selling 90% of our street lighting in small units widely spaced for which rates mostly have to cover fixed charges on the system and labor of lamp renewals and other costs independent of size of lamp.
2. A large portion of present rates must cover fixed charges and maintenance costs on wires, poles, and substation costs relatively independent of the number of lamps in a given area.
3. Selling safety lighting up to the very minimum of I. E. S. code requirements would—
   a. Increase the number of units approximately 2½ times.
   b. Increase the street lighting kw.-hr. sold, approximately 4 times.
   c. Increase the effective illumination approximately 10 times.
   d. Increase street lighting costs less than 2 times.
   e. Give immeasurable improvement in visibility and greatly reduce accident cost.
   f. Permit substantial reductions in street lighting rates.
4. Cities are now generally dissatisfied with noncompensatory street lighting rates covering service which is woefully inadequate.

Safety street lighting provides an obviously valuable service with tangible savings to the community, justifying an increased expense. Adequate service makes compensatory rates satisfactory.

Prepared by C. T. BAKEMAN,
Puget Sound Power & Light Co.

way lighting. Essentials of the highway lighting code are shown above.

In the program developed by the Puget Sound Power & Light Co., the first step was to prepare street and highway lighting standards based on the I. E. S. Code but adapted to our own territory and our own local situations. These standards form the basis for both the selling of street lighting and for the installation by the operating department. In preparing our standards, we considered various uses and needs of street lighting in much the same way as similar consideration has been given to "Light for Seeing," "Light for Selling," and "Light for Production." We felt that the use and need of street lighting fell in three definite classes: (1) street lighting for business, (2) street lighting for traffic safety, and (3) street lighting for residence safety.

The next step in our program is to offer a street lighting planning service to the cities in our territory. This involves an analysis of street needs of the city with traffic counts and with classification of the city streets into various classes as follows: (1) Primary business streets ,(2) Secondary business streets, (3) Primary traffic arterials, (4) Secondary traffic arterials, (5) Residence streets, (6) Outlying residence areas, and (7) Dangerous traffic intersections. A typical analysis is published herewith.

We then show these classifications in color on a large map of the city and lay out an entirely adequate system of street lighting up to modern safety standards. Naturally, it is impossible for the city to immediately adjust itself to this modern system, and a regular progressive plan of improvements is incorporated to pave the way for an orderly improvement over a period of years. This progressive plan takes care of the greatest needs first, with each installation either up to standard or so designed that a second step will bring it up to the safety standard.

As a further service, we offer these cities a 30-day demonstration of safety lighting to convince them of the soundness of the plan presented. In practically every case the city's greatest need is for traffic safety lighting, and our demonstration consists of lighting two city arterial blocks and one intersection, adequately. If satisfactory, this forms the model for extension of the safety lighting along the traffic artery. It is important that any such demonstration include at least two blocks and an intersection. It would be worse than no demonstration at all if too few units, or if improperly designed lighting, were demonstrated.

Increasing the lumen output of existing units rarely answers the safety need and usually passes without particular notice. A demonstration of close spacing, correct design and proper height and location shows an obvious and spectacular comparison. It is better to sell safety lighting for a few blocks than add non-effective lumens throughout the city.

These demonstrations not only are convincing to the city officials but they help educate the citizens on the values of safety lighting, thus paving the way for the ultimate sale through the proper authorities.

Aspects of Air-Conditioning*

By J. E. YATES
Pacific Power & Light Co.

ANY commercial establishment confined within four walls has an air problem, the importance of which depends on the type of business being conducted and its climatic location. In its simplicity the problem may be just one of supplying or removing air by natural or mechanical means to or from the space occupied, ordinarily called ventilation; or it may be more involved and require heating or cooling the air, or both—in short, complete all-year air conditioning.

There are three methods of approach to any ventilation problem: (1) dilute

* A report of the Commercial and Industrial Sales Bureau, Business Development Section. No committee appointed.

odorous air; (2) remove the odorous substance; and (3) introduce competing odors.

Ventilation is the most important service we can render restaurant customers. We believe, naturally, that electricity is the most satisfactory source of energy supply for preparing the food, but regardless of that, fuels are used for that purpose, which makes this subject controversial.

Ventilation is the only means of controlling odors and depends entirely on air movement. It is apparent that the only successful method of solving the ventilation problem in the restaurant kitchen is to dilute the odorous air. This has been attempted for many years by the conventional hood placed over the range with sufficient head clearance and has given only mediocre results. During recent years forced air has been employed in ventilating the commercial kitchen with remarkably successful results. Consequently we are now in a position to do a satisfactory ventilating job in the kitchen.

Two things have been accomplished in solving this problem. First and most important we have a satisfied customer and second additional revenue has been secured for our companies. A ½-hp. motor operating the fan on the forced air ventilator will, under average conditions, produce as much revenue as a domestic range. A third accomplishment of this type of ventilation is that under this plan sufficient air is moved over the range to carry away most of the heat radiated into the room during the cooking process and to this extent the heat, which is otherwised absorbed by the cooling system in cooling the dining room, is reduced.

The problem in the main dining room is not so severe. A properly designed, mechanically cooled system will give very satisfactory results and can be sold on a profitable basis for the restaurant operator. A recently completed survey by "Restaurant Management" of a representative number of food dispensing places showed that air conditioning these places resulted in increased patronage ranging from 12 per cent to 100 per cent and averaging 33 per cent, while the average check increase ranged from 5 to 38 per cent, or a 20 per cent average. This increase in business should pay for the added investment in a comparatively short period of time.

Nationally there has been a very good increase in the sales of air conditioning equipment so far this year compared with a like period one year ago. During the first quarter of 1937 national sales of air conditioning equipment totaled $31,650,000 compared with $11,000,000 for the first quarter of 1936, an increase of 187.5 per cent. Sales for March 1937 of $17,700,000 increased 220 per cent over the $5,500,000 for March 1936.

Forced air electrically heated has been successfully applied to three enterprises in the northwest.

The Puget Sound Power & Light Co. is serving a poultry farm where the hens are housed in cages 12 in. wide, 18 in. long and 18 in. high. This restricted area prevents the hens from exercising and requires supplemental heat to keep the poultry warm. A heating unit made up of ten 500-watt strip heaters over which a fan forces 450 cu. ft. of air per minute has been made up to heat the laying room and has operated very satisfactorily.

A customer of Portland General Electric Co. recently began growing mushrooms commercially. The successful growing of this plant requires carefully controlled humidity and temperature. Electrically heated "finstrips" with a fan back of it and humidity equipment with both temperature and humidity automatically controlled are being successfully used to aid in this enterprise.

Turkey raising in the northwest has developed quite rapidly. One customer of Pacific Power & Light Co. who has been raising turkeys quite successfully desired ventilation, controlled heat and humidity in his incubator and brooder rooms. This service has been very satfactorily supplied using finstrip electric heaters with a fan to force air through them.

Electric heating has two very decided advantages for this type of work. In the first place the cost of the equipment is low compared with that of other types of fuel. Secondly, it can be arranged for automatic operation thereby requiring a minimum of supervision.

Rural Sales Bureau*

Introductory Statement

By S. J. BOWMAN
B. C. Electric Railway Co.

THE Rural Sales Bureau, consisting of representatives of member companies of the association devoting all or a major part of their time to the development of farm load, is not divided into committees. The bureau functions as a committee as a whole. At the Salt Lake meeting of the Business Development Section, the bureau held conferences Thursday afternoon, March 25, and Friday morning, March 26. During these sessions the following papers or talks were presented:

"The Rural Line Built—The Job Just Started," by J. C. Scott, Puget Sound Power & Light Co.

"Developing Load in the Farm Home," by Earl A. Olson, Idaho Power Co.

"Promotional Methods," by C. A. Root, Northwestern Electric Co.

"Making Acquaintances and Securing Prospects," by Ben W. Faber, Portland General Electric Co.

"Farm Equipment Dealer Cooperation," by W. R. Newmyer, Portland General Electric Co.

"The Place of Farm Magazine, Newspaper and Direct Mail Advertising in the Promotion of Rural Electrification," by Eugene C. Schuh, Puget Sound Power & Light Co.

"Rural Advertising," by Harvey Leach, Puget Sound Power & Light Co.

"Summary of Questionnaire on Practices of Member Companies in Promoting and Recording their Rural Business," by K. W. Browning, Utah Power & Light Co.

"Building Farm Lighting Load," by Walter E. Potter, Incandescent Lamp Dept. of General Electric Co.

"Standby Supplementary Electric Heat for Laying Houses," by Ho-

* Rural Sales Bureau: S. J. Bowman, B. C. Electric Railway Co., Chairman; W. R. Newmyer, Portland General Electric Co., Vice-Chairman; The California Oregon Power Co., H. E. Goldson; Idaho Power Co., Earl Olson; Northwestern Electric Co., Cecil A. Root; Portland General Electric Co., L. C. Moore; Puget Sound Power & Light Co., John C. Scott, Eugene C. Schuh; Utah Power & Light Co., K. W. Browning.

bart Beresford, University of Idaho.

"New Electric Farm Equipment," by Eugene C. Schuh, Puget Sound Power & Light Co.

With three exceptions there are printed in the following pages abstracts or summaries of these papers or extracts therefrom. Those not printed are the paper on "Developing Load in the Farm Home" by Earl A. Olson, which was not submitted in written form; and C. A. Root's discussion of "Promotional Methods," which was delivered from an outline on charts. The paper on "Rural Advertising" by Harvey Leach, is printed in connection with the report of the Advertising Committee.

In the bureau conference there was round table discussion of all these subjects. Some of the points brought out in these discussions are abstracted from the minutes of the conference as follows.

In the discussion on "Developing Load in the Farm Home" Mr. Olson brought out that the average consumption in farms on the lines of the Idaho Power Co. was 1,900 kw.-hr. per year and the average cost was 3.2c per kw.-hr. A trailer coach, stocked with electric kitchen equipment, has been found to be particularly efficacious in presenting the electric cooking story to rural customers.

Mr. Root used charts to outline the promotional methods used by the Northwestern Electric Co. Under the heading, Personal Contacts, he discussed those made on the customers' premises and those made in group meetings, such as grange and other meetings where farmers gather. He also discussed demonstrations on the farm, at equipment exhibits at county fairs, in cooperation with county agents, agricultural colleges, etc. and in cooperation with dealers. He then discussed advertising by direct mail, by radio, newspapers, and farm papers and by special media such as farm equipment booklets, dealer catalogs and handbooks. In the discussion that followed, the importance of personal contacts with the customers was stressed in a talk by D. D. Leonard, Pacific Power & Light Co.

The paper on "Making Acquaintances and Securing Prospects" by Ben W. Faber, made a particularly strong point in the statement that the farmer may forgive a salesman the lack of complete knowledge of farming, but he will not respect the salesman who is not well informed on his own business—the company's policies and rates.

On the subject of "Dealer Cooperation" introduced by the paper of W. R. Newmyer all the company representatives present explained how they worked with the dealers in farm equipment in their territory and brought out the practically unanimous consensus that cooperation with these dealers was vital.

Principal point in Mr. Schuh's discussion of newspaper, magazine or direct mail advertising was that judicious advertising would save a salesman's time and effort by paving the way for him and thus permit him to cover more ground. Further discussion of advertising was had in connection with Mr. Leach's paper describing the advertising methods of the Puget Sound Power & Light Co., with particular reference to radio programs designed chiefly for the farmer.

There was considerable discussion of the advisability of the company sponsored news-bulletin for its farm customers, the consensus being that this was one of the most desirable forms of advertising in the rural field. Some companies not having talent in their organizations for preparing such a paper stated the cost of procuring such talent was prohibitive and that consequently they used the commercially printed magazines.

The general subject "New Electric Farm Equipment" was opened for discussion by a paper by Eugene C. Schuh in which were explained a chicken house floor cleaner, automatic chicken feeder, small dairy water heater, and a potato sorter. In the discussion that followed, S. J. Bowman told of an electric incubator for producing cultured milk which was in satisfactory use in his territory. Earl A. Olson described a non-pressure electric water heater sold by the Idaho Power Co. L. C. Moore, Portland General Electric Co., described a small dairy water heater made by Fowler Manufacturing Co., Portland.

Mr. Moore also reported on a combination sharp freeze and ordinary temperature farm refrigerator manufactured by the Olson Refrigerator Co., Eugene, Ore. This is a large capacity refrigerator with a Frigidaire unit maintaining a temperature of 10 deg. in the sharp freeze compartment. In the discussion of this device it was brought out that the practice of preserving foodstuffs by the quick freezing method was on the increase.

Cecil Root reported on the forced draft home built brooder being used in the territory of the Northwestern Electric Co. In the discussion of brooders which followed, attention was called to a cheap, over-rated and generally unsatisfactory brooder being marketed by certain mail order houses. It was felt that something might be done about trying to induce these concerns to sell a better product. Also in this discussion on brooders, the "contact heat" type of brooder was generally condemned as unsatisfactory.

A committee was appointed to expedite the preparation of two or three additional sections to the "Electricity in Agriculture Handbook" produced by the bureau in 1933.

The Rural Line Built— The Job Just Started

By J. C. SCOTT
Puget Sound Power & Light Co.

IF FARMERS are to use a sufficient amount of electricity to make it economically possible to construct lines, it is necessary to maintain a continuity of service to the highest degree possible. The farmer's wife will not use electricity for cooking if she gets up a few mornings, turns on the switch, and finds no heat. The poultryman who is hatching and brooding chicks with electricity must feel that his service is so continuous that electricity is safer than any other method.

After the farmer is sold on the idea that he can depend upon the continuity of his electric service to the same, or a greater degree, that he can depend upon coal oil to brood and incubate chicks, gas engines to irrigate his land, and hired men to milk his cows, it must be proved to him that this new electric machinery and apparatus will work satisfactorily and economically. Experience has shown that farmers will not use any appreciable amount of electricity unless someone teaches them many simple rules in connection with its use.

Here is an example of what happens when no one helps the farmer to use electricity: A farmer had seen electric motors doing the job formerly done by a steam engine in a sawmill. He bought a motor to run his wood saw which he had operated the year before with an old gas engine. Some of his neighbors told him that no electric motor could ever run a wood saw. This farmer was taking lighting service from a farm line. Without saying anything to the power company, he ran a wire from his meter to the motor on the saw and threw the switch. His neighbors were right—the motor turned the saw, but it most certainly would not saw the wood. When the power com-

pany local manager heard about it he visited the farmer and found him trying to saw wood with a 5 hp. motor served with 300 ft. of No. 14 cord and a transformer much too small for the job.

Until an electric method is quite commonly used in a community, it seems that each farmer needs assistance and instruction on each new installation. If farmers are to be expected to use enough electricity to make general farm electrification possible, it is the business of the power company to be ever on the job attending to this type of service.

The signing up of customers, and the construction of rural lines to serve these new customers with electrical energy is just a start in the job of rural electrification. No farm or rural dwelling is electrified until the customer is making every practical use of electricity. Truly, when the construction of a new rural line is completed the job of rural electrification has just started.

Many farmers have electric service today who could not have had it a few years ago because much of the current-consuming apparatus now in use on their farms was not then in existence. Likewise, many farms cannot be served today which, in years to come, it may be possible to serve because of the development of apparatus and machines that will help the farmer in his business and will make it profitable for him to use enough electricity to make the lines self-supporting.

For rural electrification to be profitable each household and farm device must be understood by the farmer or his wife to an extent where he or she can successfully operate it. Each device must operate in a way that the farmer and his wife realize that it is doing the job better for them than any other device or method.

After apparatus has been developed, the farm electrification program with regard to this device has only begun. It must be manufactured and distributed, making it easy for interested farmers to obtain the equipment. Educational work is necessary to acquaint farmers with new electric methods and their advantages.

To suppose that a large amount of electricity will be used on rural lines without further effort on the part of power companies, manufacturers, educational institutions, and others, is a mistake. From the experience of power companies it is apparent that when they take a recess in the promotion and advertising of electric equipment of any kind, it is immediately reflected in a decrease of current consumption. Similarly, when promotional activities are pushed more vigorously, current consumption is increased.

If farm electrification is to be of a real economic value to farmers and to the power companies, it should be aggressively pursued with a complete program, a program which includes, besides line construction; (1) continuity of service which the farmer can depend upon, (2) development of electric apparatus enabling the farmer to produce a better product and do it more economically, (3) education as to the advantages of using electric methods on the farm, (4) getting new devices manufactured and dealers developed so that farmers can obtain them easily, and (5) service and assistance necessary for the farmer and his wife to understand and properly operate every electric appliance which comes onto the farm, regardless of who sells it.

Making Acquaintances And Securing Prospects

By BEN W. FABER
Portland General Electric Co.

IN developing farm electrical load, why not use the farmers' own methods? The farmer doesn't expect to reap a harvest until after he has plowed, harrowed, prepared his seed bed, and followed this with cultivation —finally reaping the harvest. A farm service department, likewise, must canvass and segregate, supply data and information, cultivate and sell, and finally reap kw.-hr. sales.

Every rural area presents plenty of opportunity for load building, but every farm is not necessarily a good prospect. Therefore, we canvass our farm customers, making note of the needs of each. We also note the type of farm they operate and classify them as to their degree of progressiveness. This canvass should be brought up to date at least once a year, and a utility should have sufficient farm service personnel so this can be accomplished. There is a vast variation in districts, but in our territory we are trying to handle about 1,000 farm customers per man. We feel that the time will come when a farm service representative will be required for each 500 farm customers. Especially is this true if we hope to increase revenues from our minimum customers and take care of new line extensions.

Approaching a farmer in the right manner is the keynote to successful load building. Unless absolutely necessary, do not plunge right into the reason for your call. Attempt, if you can, to get on common ground with the farmer. A little knowledge of agriculture is useful. Knowing what is going on in the community is a big help. Perhaps the boy has had 4-H honors bestowed upon him. Perhaps the farmer has just made a record with a milk cow. Therefore, follow your local newspaper carefully and glean other pertinent information.

Ignorance of the latest farming practices the farmer would excuse, but lack of suitable information on your own work will not inspire his confidence. Therefore, know your company policies, know your company rates and tariffs and be ready to assume responsibility. Stand up for your rights and the rights of your company, but also hold yourself accountable if you or your company have made mistakes. On your first call with a farmer, outline briefly what your work consists of as a farm service representative.

Supplying information to rural customers is an important part of load building. Our chief method of supplying general information is through our company "Monthly Farm News," which gives information concerning new installations and discusses timely load building topics. We also mail a monthly farm electrical magazine with good results to a select list of customers. In addition to this, we place manufacturers' literature in the hands of interested prospects. Recommendations as to performance and cost of operation should always be given, based as far as possible on actual data. Do not attempt to hand a farmer "high pressure" information.

After a farmer has been induced to add a piece of electrical equipment, continue to cultivate him as he cultivates his crop after it is planted. Perhaps some problem in regard to the operation of the equipment presents itself which he does not understand. Perhaps a neighbor has seen the equipment operate and is interested.

We have found it good practice to call on prospective farm customers before they begin wiring. Adequate farm wiring makes load building much easier. On one particular line extension which we followed rather closely, we were able to induce the majority of the customers to install three-wire services.

Farm Equipment Dealer Cooperation

By W. R. NEWMYER
Portland General Electric Co.

IN the Willamette Valley Division of the Portland General Electric Co., with Salem as headquarters, we have cordial relations with our farm equipment dealers. As we do not handle farm equipment to any extent, we are able to turn prospects to the dealers, which naturally makes them friendly toward us. We ask the dealers to give us a monthly report of electrical equipment sold. By getting such a report from them, we are able to drop in on the new owner soon after the equipment is installed to see that service is satisfactory and that the equipment is doing what it should do. By making such calls we are very frequently able to make a much more satisfied user out of the new owner and, as a result, get the names of neighbors who have seen the equipment and might be in the market for similar help.

The only appliances for use outside the farm home which we sell are those which are new on the market and have not been developed to the extent where the dealers feel that they should stock them. As a case in point, soil-heating equipment and O. S. C. type underheat brooder might be cited. We advocated these devices and sold them until the applications were far beyond the experimental stage. We then proved to the dealers that they were being used by the farmers and that it was to the interest of the dealer to stock them.

The big trouble we have with the dealers is to get them to put salesmen in the field. They will send out salesmen on domestic water systems, but not on other types of equipment.

The big advantage of not selling equipment is that we can feel freer in recommending certain equipment for certain jobs. If we had equipment for sale, of course we would be forced to try to sell that particular make even though some other make on the market might fit the customer's condition better.

Our experience of the past two years on the intensive campaign by everyone concerned to sell domestic water systems has proven that a real cooperative effort will get results. In our territory there are approximately 3,600 rural meters. During 1935 a total of 172 domestic water systems was sold, and in 1936, 191 water systems were sold. These are systems that we know were actually installed. Undoubtedly many more were sold of which we have no record.

If we can get manufacturers, dealers and power companies working together to sell domestic water systems, why can't we do the same thing for brooders or other appliances? I should like very much to see a movement started right now to promote a campaign similar to the running water campaign among the brooder manufacturers so that this campaign could break about the middle of January, 1938.

Advertising's Place in Rural Electrification

By EUGENE C. SCHUH
Puget Sound Power & Light Co.

IN CONSIDERING advertising in connection with rural load building, there are three different media which can be effectively used, namely: the farm magazine, the newspaper and direct-mail. The farm magazine covers a large area and many different kinds of farming. For this reason the advertising must be of a general nature. The response will not be so great on a percentage circulation basis, but this type of advertising does help to keep farm load building equipment before the public.

All farmers do not subscribe to farm magazines, but since most farmers are interested in local affairs they do subscribe to their local newspapers. This very fact makes the newspaper a valuable medium for advertising to promote rural load building. Farmers will pay closer attention to ads which they see in the local paper than to national magazine ads because the newspaper hits closer to home. Many local events and dealers are centered around the community newspaper and these things help to give a local touch to anything advertised in the paper.

Direct-mail is perhaps the most expensive form of advertising when considering initial cost. Yet, it can, if properly managed, bring better results than any other form of advertising. This type of advertising must be used with sound judgment. To be effective, the program must be carefully planned and letters sent only to those farmers who we are sure will be definitely interested in the method or appliance we are trying to sell.

Of course an ad cannot take the place of a personal call, but a well-planned advertising campaign can save a lot of lost motion. When a rural electrification representative calls on a poultryman to talk with him about brooding, how much faster everything works out if the farmer, through advertising, is already interested in the brooder and is somewhat familiar with the principle involved. But when the farmer has never heard of the forced draft electric brooder, it is almost an impossibility for the representative to introduce the machine and convince the poultryman that he needs it, all in the same call. In the majority of cases it will require at least one more call-back on the farmer to sell him the idea. Not only is this true of brooders, but the same thing holds for all rural load building equipment.

The Puget Sound Power & Light Co. advertises in nine different magazines. In the spring we feature electric hotbeds, brooders and running water; summer ads include irrigation, dairy water heating and refrigeration; fall and winter advertising take up poultry-house lighting, stump burning and poultry water warming. While these magazine ads do not give information as to price and definite dealers, they do acquaint the farmer with the latest developments in electrical appliances for the farm. From actual experience, I can say that this advertising acts as a bridge for the gap which exists when the farm representative calls on the prospective farmer.

Newspapers may be used to localize the advertising, featuring such things as rates and specific load building appliances that are adapted to the locality in which the newspapers circulate. During the summer of 1936 the company featured in its newspaper advertising the low kw.-hr. cost available to the farmer. The campaign consisted of a series of four ads for each county that we serve. In each case the ads were made up of pictures of well known farms in the county and "close-ups" of the operators, with a statement by each man telling how handy he had found it to have the electrical servant on his farm. The average kilowatt-hour cost for the preceding year was given as well as a list of all the appliances that were used on farms being featured. This campaign proved to be very effective as let-

ters were received from many other farmer saying they had just figured out their own average rates and they were as low as the ones used in the ads.

As has been shown above, direct-mail is the most expensive advertising we have when we are considering only the first cost. However, this type of advertising can have a place in rural load building. If the farm representative will classify the customers in his territory as to whether they are poultry farms, dairy farms, grain farms, etc., and make note of the electrical equipment now in use on each farm, he will have a very good file built up from which he can get a really effective mailing list for advertising any special equipment. The rural electrification department of the Puget Sound Power & Light Co. is classifying farm customers on special cards. On one side of the card is a form for filling in the name, address, account number, location, classification, renter or owner, acreage, number of stock, and remarks. The other side of the card gives a list of thirty-three electrical applications so arranged that by making an "X" opposite the application in question, the representative can record whether the customer is now using, interested in, or should have this particular appliance. This card system is working very satisfactorily as a farm customer index and will make a good direct-mail list.

After making up the direct-mail list, the next job is to send an effective letter out to the farmers in question about a month or two before the season for the particular appliance begins. The letter may contain a testimonial from some well known farmer in the district with a story about his successful experience with this appliance. After sending the letters the farm representative should make an immediate follow-up so that there will be a definite tie-in with the direct mail letter. If the magazine advertising or the newspaper ads have not reached the farmer, there is still a very good chance that the direct mail letter followed by the farm representative, will go far toward helping the farmer to see the advantages of doing the work the electrical way.

To summarize, magazines introduce and keep new developments before all groups of farmers; newspaper ads localize the new developments applicable in the communities in which the newspapers circulate; and direct mail advertising is the means of reaching a particular group of farmers with a certain purpose in mind and with the least possible waste of circulation. The total effect of the three media when used together effectively is to form a definite tie-in with the work of the rural electrification representative, bridge the gap between farmer and representative and thereby effect a saving of time, effort, and traveling expense.

New Electric Farm Equipment

By EUGENE C. SCHUH
Puget Sound Power & Light Co.

DURING the past year there have been several new developments in the Puget Sound country which are worthy of mention in that they save time, labor and money for the farmer.

Chicken House Floor Cleaner — Not only is it a hard job to clean the hen house floor, but this particular chore requires a large share of the time necessary in cleaning a chicken house, and consequently, limits the number of birds which one man can care for. Carl Jepsen, a progressive poultryman of Whatcom county, has worked out an electric floor scraper which should be of interest to all poultrymen. The entire machine is mounted by means of an iron framework on four wheels, two 3-in. casters at the back and two coaster wagon wheels on the front. Forward motion is furnished by the operator who pushes the machine over the floor. The actual work of scraping is done by a 1/3-hp. motor mounted on the frame. Power is transmitted from the 2¼-in. motor pulley to the 12-in. drive wheel by means of a V-belt. The drive wheel in turn operates an eccentric shaft which gives the scraping blade a motion similar to that used when scraping off a meat cutting block. The scraping blade is made of ¼-inch steel with the scraping surface sharpened. On top of this blade is mounted a sheet metal hopper with three sides 8 in. in height, which holds the droppings until the end of a swath is reached.

The floor is cleaned by first removing the long straw and all other loose material. Then the operator plugs in the 30-ft. extension cord for the motor and snaps on the switch. With the scraper in motion he pushes the machine down the floor taking a swath 24 in. wide. When the end of the room is reached a simple downward pressure on the handle will raise the scraping blade so that the machine can be turned around to scrape the second lane on the return trip. The handle is similar to a lawnmower handle and is about the same height. The scraper may be used on either wood or cement floors. When used on a wooden floor best results are obtained by running cross-wise to the direction of the grain of the wood.

This simple machine reduces poultry house cleaning time by at least 50 per cent and on many farms this will mean a considerable saving in expenditures for hired help. Mr. Jepsen believes he will be able to put this cleaner on the market for about $50.

Automatic Scratch Feeder—One of the most important factors in successful commercial egg production is regularity of feeding. This is due largely to the fact that a commercial flock is functioning at a very high rate of speed and the slightest variation from the normal procedure will throw the birds off production. On many poultry farms it is often inconvenient to be on hand for the afternoon grain feeding, and then there are those poultrymen who do not care to get up as early as the lights go on in the morning to feed the scratch. To overcome these difficulties, George A. Pollock, Everett, in collaboration with Glen Cushing of the Puget Sound Power and Light Co., has developed an automatic poultry scratch feeder. One such machine will efficiently feed scratch to birds in a 24-ft by 30-ft. pen.

This feeder consists of a wooden hopper 15 in. by 15 in. by 17 in. deep, mounted on a ⅜-in. iron pipe stand 72 in. high. The hopper is made of ½-in. wood and has a hinged cone-shaped cover to prevent roosting on top of the machine. On the inside, the bottom part of the hopper is funnel-shaped so that the grain will fall in a narrow stream onto the face of a 5½-in. disc operated by a 1/20-hp. motor.

When the operator puts the desired amount of scratch into the hopper the weight of the grain closes an automobile stop-light switch in the circuit of the motor. The motor is connected to the bright light circuit. When the time clock turns on the lights the motor revolves the disc on which is falling a small, continous stream of scratch and the scratch is thrown about the room. After the hopper is empty the decreased weight allows the switch to open and this stops the motor. There are two adjustable baffle plates made of ¼-in. plywood on each side of the disc. These plates can be moved up and down to regulate the throw of the machine. If it is necessary for the farmer to be in town until after feeding time he simply fills up the hopper before leaving and when he returns his night lights have been turned on and the birds have been fed at the usual time.

Mr. Pollock sells this feeder for $25, but poultrymen can build their own feeders from plans furnished by the

Puget Sound Power and Light Co. at a cost of about $15 exclusive of labor.

Neither of the above-mentioned appliances consumes much current. However, they are both instances of where electricity has stepped in to do away with drudgery and save the farmer money, and when we help the farmer to save money in his everyday operations he is going to be better able to buy more appliances and use more kw.-hr.

Dairy Water Heater—The success of the dairy industry depends to a large extent upon the quality of product and quality can be traced right back to the farm. Consequently, hot water in the milk house is essential. It is used not only for cleaning utensils but for many other purposes such as washing off udders before milking and warming water for young stock.

For some dairy farms the 40-gal. and even the 30-gal. monel metal water heater is too large an investment. In order to provide an economical unit for such farms our engineering department has designed a 15-gal. monel metal water heater which may be used either as a pressure or a non-pressure job. The unit is equipped with one 1,150-watt, 240-volt element, operating on a thermostat. The tank is completely surrounded by 3 in. of rock wool insulation with a white-enameled metal covering over the outside. A 2-in. brass pipe protrudes from the top and center of the tank and a ¾-in. faucet comes out on the side near the bottom. If the tank is to be used as a non-pressure job the farmer simply pours the cold water in at the top and draws the hot water from the faucet at the side. All that is necessary to convert the heater to a pressure job is to take the faucet out of the side, pipe the cold water in through this opening, bush the 2-in. brass pipe at the top down to ¾-in. and lead off from here for the hot water outlet. The majority of these units are being installed as pressure jobs as this does away with the extra work of refilling the tank every day. This dairy water heater sells for $57.50 and operates on our off-peak rate of ¾c per kw.-hr.

Potato Sorter—Grading potatoes by hand is slow and tedious work. In order to help the farmer speed up his job, the State College of Washington has developed an electrically driven potato grading table which has proven to be a time and labor saver. The machine consists of a long framework over which runs a slow-moving, endless belt. This belt is made of a single piece of woven link conveyor belt, 1¼-in. mesh, No. 10 galvanized wire. This belt is quite flexible and durable but does not permit the use of guides for pushing potatoes off at the sides.

There is a 1-in. wooden bar down the middle of the conveyor which makes it possible for two grades to be carried over the end without mixing. The other grades are picked off and dropped into sacks hanging at the sides of the framework. Operating at full capacity the grader will keep five or six men busy.

Power is furnished by a ¼-hp. to 1/3-hp. motor. The belt should move along at a rate of 10 to 20 ft. per minute, the rate being determined by the size of the crew. Exclusive of motor, switch and labor, this sorting machine will cost $25 or $30 to build.

Building the Farm Lighting Load

By WALTER E. POTTER
Incandescent Lamp Dept., General Electric Co.

FOR a considerable period of time we have sold electrical service in rural areas to assist the farmer in all other tasks except light for seeing. Regular added use of even small increments of service mounts up over the course of a year. For instance, a simple 100 watt lamp if burned three hours per day at a rate of 5c per kw.-hr. will produce $5.48 gross revenue per year. Even for a customer now using as much as $30 worth of service per year this small amount of added service will provide an 18 per cent increase in yearly gross earnings of the utility.

Just as this business of life goes on in city and urban districts with its "seeing" requirements for reading, sewing, desk work, kitchen work and other common tasks, so to an even greater extent is this true in the rural home. There these "seeing" tasks have always been more difficult, inconvenient and restricting. Work begins in the farmhouse kitchen several hours before most city and urban home activities are under way. The rural housewife's fingers are rarely idle—they are sewing, mending and doing many other tasks requiring visual application.

The farmer, his wife and children spend many long evenings reading, sewing, studying or some other occupations which are fairly difficult for the eyes. We have been content to allow wiring inadequacy, false estimates of farmers' purchasing power and generally a lack of sufficient lighting knowledge to attack this market, to impede our progress.

People don't burn their lights for four basic reasons: (1) Natural human inertia, which slows up all improvements of living standards and which creates basic necessity for organized sales operations in all lines of business; (2) false notions about dim light; (3) false ideas about the cost of light, and (4) mechanical limitations of lighting equipment.

Fundamentally, selling consists of the changing of customer thoughts, opinions and prejudices. The most cursory study of the progress of civilization will reveal that change has always been resisted. Only simple, patient, persistent, repeated advertising and selling have persuaded people to accept progress and improvements.

The new science of seeing story which has been so consistently and thoroughly advertised in magazines, newspapers, radio and other mediums plus editorial stories and features have penetrated in the rural areas, aiding to combat the four basic reasons that people don't burn their lights.

Lighting fixtures and I. E. S. approved lamps are available in wide variation of style, type and price which will take sufficient wattage to provide effective results comfortably. Approved I. E. S. floor lamps with light bulbs may be had for as little as $7.00, while I. E. S. junior floor lamps may be purchased from $5.00 up. Table lamps of this type are available at a cost of even less than half of the above figure, one of the new innovations so adaptable to farm home bedrooms with its plastic cone diffuser retails for about $1.00. Attractive fixtures for bedrooms and halls with globes of glass, decorated or not may be bought for as little as $3.50. An existing drop cord or close ceiling socket can be made with "adaptor" cones which are procurable in some of the chain stores for as little as 35 cents. For shower or ceiling pan fixtures, small parchment shades are available in the ten-cent store.

Frequently the dining table in rural homes is used for many other activities such as games, studying and reading. The expenditure for one of the I. E. S. bowl type units can often be more than justified and met. There is a need for light outlets in the cellar, on the back stairways, clothes closets and on the exterior of the house. A ceiling outlet and maybe two in the kitchen, and a lighting outlet on each side of the mirror in the bathroom are essential.

Portable lamps should be used wherever a seeing task is performed in the living room. We have a high saturation of radios in the rural areas which makes it easily possible to attach an I. E. S. lamp to the same outlet. A minimum

of two I. E. S. lamps per living room is important.

One utility last year sold 648 units of residential lighting to new farm customers with estimated annual revenue of $11,664. It required nearly 50 per cent more units of domestic appliances to produce the same revenue.

Many a farmer's wife delights in growing and caring for house plants during the winter months. Now they may be grown in the home under plant lighting fixtures which may be purchased from almost any portable lamp manufacturer. A wide variety of these units is available, covering a wide price range, and in addition to illuminating the plants they supply excellent light for reading and sewing. These units being of varying sizes require from 60-watt to 300-watt lamps.

Rickets in children may be cured or prevented by an ample supply of ultraviolet light. Ultraviolet also helps to build up strong teeth. The S-1 and S-2 Sunlamps offer an excellent source of ultraviolet. Another health lamp is the infra-red or heat lamp. Equipped with a Mazda CX lamp, their radiant energy is of such a wavelength that it will penetrate much more deeply into the flesh than will the heat from a hot water bottle, a heating pad or other luminous heaters.

The use of these lamps is not limited to the house—ultraviolet or sunlamps are being used extensively in poultry farms and dairies to keep the birds and animals in better condition and cause them to produce more eggs and more milk, increase the vitamin D content of eggs and milk, and to increase hatchability, reduce mortality and speed up growth.

Let us not consider yard lights and barn lighting as the only lighting on the farm. More hours use are required in the home by more members of the family than for lighting anywhere else on the farm. Farmhouse lighting can be made to equal the revenue received from other sources.

Practices in Promoting And Recording Rural Business

By K. W. BROWNING
Utah Power & Light Co.

A SERIES of questions pertaining to rural business was sent to 13 member companies. Replies from 11 of these were received, of which two showed little or no activity. Replies of the other nine were tabulated and there follows a summary of these replies:

The largest company had 126,489 residential customers not including farms. The smallest had 4,500. The largest number of farm customers served by any one company was 26,784. The smallest was 712. The company reporting the largest average annual kw.-hr. consumption per farm reported 3,178 kw.-hr.; the average for the companies reporting was 1,615 kw.-hr. All the companies reported an expected increase in average annual consumption per farm during 1937, ranging from 11 to 151 kw.-hr., with an average of 87.

The company reporting the largest number of farm electrification specialists had one man employed for every 1,100 customers. The average of the nine companies was one man per 2,400 customers. The average number of part time salesmen so employed was one man for every 1,650 customers.

All the companies cooperated in one way or another with such farm agencies as agricultural colleges, county agents, farm bureaus, granges, vocational agriculture teachers, etc.

Ways in which the companies cooperated with dealers selling electric farm equipment were listed as follows: Notified dealers of new customers, monthly contact with dealers, furnished prospects to dealers, helped close sales, cooperative advertising, established dealers where there are none, cooperative displays at exhibits and fairs, furnished publications and literature.

All but two companies merchandise directly some electric farm equipment, which was listed by these companies as follows: dairy sterilizers, dairy water heaters, water heaters, brooders, soil heating equipment, running water systems, poultry water warmers, water trough warmers, yardlights, motors, portable motors, steam boilers, small motor grinders.

Three companies conduct seasonal campaigns on various types of equipment as follows: one on water systems; one on brooders, dairy water heaters, pumps, farm motors, lighting; one on brooders, dairy water heaters, water systems, yard lights.

The companies were asked to name the most important farm device other than household equipment covered in their promotional activities. The following items were named: irrigation, stationary spray plants, farm motors, brooders, dairy water heaters, dairy steam boilers, water systems, stump burners, hot beds, poultry water warmers, pig brooders and lighting.

Best possibilities for development during 1937 were said to be in the following fields and devices: irrigation, brooders, spray plants, water systems, poultry uses, greenhouse heat, ventilation and lighting; battery brooder room heat and ventilation; farm motors, portable motors and farm lighting.

Three companies were surveying their farm business. Four companies publish their own farm paper or bulletin and send it to all their farm customers. Three companies use "Electricity on the Farm."

Engineering and Operation Section†

Introductory Statement

THE fourteenth annual general meeting of the Engineering and Operation Section, held at Heathman Hotel, Portland, April 21 to 24, was attended by 218 delegates, of which 111 were from outside of Portland. General sessions were held morning and afternoon, April 21, 22 and 23, while Saturday morning, April 24, was given over to a trip to the Bonneville project or to visiting points of interest on the systems of the local companies.

Joe Hellenthal, Puget Sound Power & Light Co., section chairman, and Tom Purton, Idaho Power Co., vice-chairman, divided responsibility of presiding. The program of each of the six committees was conducted by the committee chairman. All papers and reports are published in the following pages with a brief summary of the discussions thereon, except as noted.

At the opening session, Wednesday morning, Paul B. McKee, president, Pacific Power & Light Co., extended greetings on behalf of the electrical industry of Portland. He urged engineers to deal with realities, while at the same time maintaining a far-sighted and imaginative viewpoint. The economics of every situation are important and it is the engineers job to tell the executives when projects are economic, he said. Responding to Mr. McKee's remarks, LeRoy A. Grettum, Eastern Oregon Light & Power Co., vice-president of the association for Oregon, stated that the engineers should first determine the facts and then interpret them to show the best course of action.

After these preliminaries, the meeting was turned over to H. H. Schoolfield, Pacific Power & Light Co., chairman of the Power Systems Engineering Committee. His committee program consisted of two papers, one on "Carrier Communication over Distribution Circuits" by J. D. Hertz, and one on "Stability of Inter-connected Systems" by C. E. Cannon. The paper by Mr. Hertz is not published herewith but will be published in the July issue of ELECTRICAL WEST.

The association's leaders. Standing (left) Berkeley Snow, secretary-manager and (right) A. Vilstrup, British Columbia Electric Railway Co., Ltd., newly-elected vice-chairman. Seated (left) is Joe Hellenthal, Puget Sound Power and Light Co., retiring chairman of the section with Tom Purton, Idaho Power Co., new chairman, at his side

Wednesday afternoon was given over to the Power Production Committee, conducted by E. H. Collins, The Washington Water Power Co., chairman. Among the papers was one on "Increasing the Capacity of the Northwest's Largest Boiler" by Russell F. Miller, which was published in the January issue of ELECTRICAL WEST. Another paper, "Electrical Features of the Bonneville Project," by L. E. Kurtichanof, has been briefed herein as a complete record of the Bonneville propect will be presented in pictures and text in ELECTRICAL WEST later this year.

The morning session, April 22, opened with the program of the Codes Committee with Magnus T. Crawford, Puget Sound Power & Light Co., chairman. The paper by L. R. Gamble on "National Electrical Safety Code Requirements for Overhead and Underground Construction Compared with State Laws and Regulations now in Effect" is not published.

This session closed with an address by W. C. Mainwaring, B. C. Electric Railway Co., vice-president of the association, on "Relationship Between Engineering and Commercial Departments", an abstract of which is published herein.

At the opening of the Thursday afternoon session, A. W. Copley, Westinghouse Electric & Manufacturing Co., San Francisco, and chairman of the Engineering Section, P.C.E.A., gave a very interesting exposition, illustrated by charts and pictures, of the mounting of the 200-in. telescope for Palomar Mountain. This is omitted.

The Utilization Committee, with Paul P. Ashworth, Utah Power & Light Co., chairman, occupied the balance of this session. Two of these papers have been previously published: "Kitchen Design, an Aid to Load Building" by Walter

Educators keep in close touch with industry developments. Among those present at the meeting were (left) E. C. Starr, E. E. Dept., Oregon State College, and D. C. Loew, dean of engineering, University of Washington

† Executive Committee: J. Hellenthal, Puget Sound Power & Light Co., Chairman; T. A. Purton, Idaho Power Co., Vice-Chairman. B. C. Electric Railway Co., A. Vilstrup; The California Oregon Power Co., J. C. Boyle; Eastern Oregon Light & Power Co., O. D. Lanning; Grays Harbor Railway & Light Co., William S. Hill; The Montana Power Co., H. H. Cochrane; Northwestern Electric Co., J. D. Ellis, O. L. LeFever, E. F. Pearson; Pacific Power & Light Co., R. J. Davidson, H. H. Schoolfield; Portland General Electric Co., Walter Brenton, C. P. Osborne; Puget Sound Power & Light Co., M. T. Crawford, G. E. Quinan; Utah Power & Light Co., Paul P. Ashworth; The Washington Water Power Co., E. H. Collins, J. B. Fisken; West Coast Power Co., C. P. Eliot.

Brenton, March issue of ELECTRICAL WEST, and "Electrical Heating of Residences" by Dean H. V. Carpenter, April issue of ELECTRICAL WEST. The discussion on Dean Carpenter's paper, however, is published herein.

First of Friday morning was given over to the Accident Prevention Committee with J. D. Ellis, Northwestern Electric Co., chairman. The report by Mr. Ellis of the "1936 Accident Experience of Member Companies" is published in summary form. Tables of accidents were available at the meeting in mimeograph form as were descriptions of the lost time accidents, and these tables and the descriptions have been distributed in this form to all member companies.

This session closed with a talk by J. O'R. Coleman of the engineering staff, Edison Electric Institute, on "Some Developments in Utility Engineering Nationally," of which an abstract is published.

The Transmission and Distribution Committee with E. F. Pearson, Northwestern Electric Co., chairman, presiding, presented its program Friday afternoon. Of the four papers presented only one is published here, "Recent Developments in Transmission and Distribution Apparatus" by John Bankus. Of the others: "Protection of Equipment from Over-Voltages" by H. L. Melvin, is to be published in the July issue of ELECTRICAL WEST; "Development of Low Cost Distribution Systems in the Northwest" by R. J. Davidson, and "Distribution Transformer Loading" by F. H. Ferguson, were published in the April issue of ELECTRICAL WEST. Brief discussions on the papers by Mr. Bankus, Mr. Davidson and Mr. Ferguson are published herein.

Friday night the delegates and their wives attended the annual banquet at which H. H. Schoolfield, chairman of the local arrangements committee, was toastmaster. Entertainment included singing, dancing and vaudeville stunts.

Relationship Between Commercial And Engineering Departments*

By W. C. MAINWARING
B. C. Electric Railway Co.

THE engineer and the salesman have one objective, that of rendering the greatest possible service at the lowest possible cost with a resultant increase in net revenue to our respective companies. It has often been said by engineers that commercial men were too prone to accept credit for some accomplishment that rightfully belonged to the engineer, but, you will agree, this is the exception rather than the rule. Is it not a fortunate thing that the engineer and the salesman are so fundamentally different in temperament? The engineer is a student, he is naturally modest, his interest in a problem diminishes when the problem is solved and he looks for new fields to conquer, caring little what anyone thinks about his success. The salesman is an enthusiast, he believes that success is infectious and he sells his wares or his services by inoculating others with his enthusiasm. A properly directed combination of engineering thoroughness and commercial enthusiasm should be the constant aim of executives in charge of these particular departments.

In the early years of our industry, we were concerned chiefly with the use of electrical energy for lighting purposes, and potential loads in many cases were computed on the basis of lighting requirements only. On this account we are faced today with service facilities that are totally inadequate to meet the requirements that a broader use of electrical energy brings about. We cannot be blamed for failing to provide service for heavy current consuming devices that were as yet undeveloped, but in the light of present day conditions we must realize the absolute necessity of careful system planning which can be brought about only through the closest co-operation of engineering and commercial departments.

I would go so far as to recommend that the installation of service facilities and equipment within the consumer's premises be accepted as just as definite a responsibility of the engineering department as those on the company's side of the meter.

The large percentage of business secured today will come from increased use by existing customers and not from entirely new customers. Highly desirable as this may be, it is offset to a great extent by total inadequacy of existing wiring. The most wonderful load building medium yet presented to our industry is the "Better Light Better Sight" activity and every day we have to turn down business because we failed to plan for the future when many of our large buildings were under construction. We should be just as interested in the facilities for use as we are in the facilities for service, and we should see that codes governing wiring and other supply requirements are as simple as possible, consistent with safety, and permit of work being done at the lowest possible cost.

It is not necessary for me to stress the increasing necessity for continued load building. From the routine work of the office boy to the complex management problems of the president every activity of every utility employee is directly or indirectly connected with load building, so every individual and department must consider they are a component part of a highly specialized selling organization. If our industry is to live and thrive it must grow apace with or preferably a little ahead of the general development which is going on in our respective communities.

A good deal of the work incidental to everyday load building is in the nature of routine salesmanship, which does not require continuous engineering attention, but there are other features of this task where engineering aspects are continually encountered and where economic studies must be made of technical details. Owing to the load characteristics of some of the new load being added to our systems it is imperative that a proper relationship exist between engineering and commercial departments. Air conditioning and substantially increased commercial lighting loads must be taken care of in our most heavily loaded business areas and the revenue obtainable may not justify the

Liaison between sales and engineering departments was provided by George Wisting (standing, left), chairman of the commercial section, N. W. E. L. & P. Assn., and W. C. Mainwaring (seated, right), B. C. Electric Railway Co., Ltd., and vice-president of the association. Joe Hellenthall (standing behind him) seems amused at the story that O. B. Coldwell, Portland General Electric Co., is telling

*An abstract.

expense of increased service facilities.

This brings to our mind the question of rates. When we consider that the average cost of our service from the customer's point of view has been reduced 50 per cent during the last 20 years, new applications for the use of electricity will necessitate a complete study of our rate theory by engineers because it is quite possible that some of this business may not be attractive at existing rates.

The years of the recent economic depression laid emphasis also on the reduction of service costs. I am pleased to note from the program of this meeting than an important paper is included on the subject of low cost rural distribution. This matter has been given close study in our respective territories and elsewhere during the past few years and considerable progress has apparently been made with regard to simplification of construction.

An important point in connection with reduced construction costs that must be continually borne in mind is that to be of advantage it must be carried out without sacrificing reliability. Occasional line outages were of little consequence when lighting was the main if not the only service used by our rural customers, but with the introduction during recent years of incubators, brooders, milking machines, and motorized farm equipment of every description, an absolutely dependable electric service must be maintained, and this requirement is of prime consideration in any attempt to build up load of this type.

In an Association such as this, the work of which is divided between different sections, it is inevitable that a certain amount of overlapping exists. For example, there is a common bond of interest between the Utilization Committee of your section and the Business Development Section. We cannot help but appreciate the deep interest taken in load building by engineers when we see papers and reports presented at their meetings dealing with "Illumination", "Electric Kitchen Layouts" and kindred subjects. This situation necessitates close cooperation in many cases between the engineering and commercial staffs of the various utilities. Such cooperation is a perfectly healthy and normal condition in a well managed concern, but to keep such close relationship happy and free from occasional misunderstanding and friction it is necessary that proper recognition shall be given by each side to the accomplishments of the other.

We find national averages of domestic consumers slightly in excess of 700 kw.-hr. annually, and we know that a fully equipped electric home will account for 6,500 kw.-hr. We should not be satisfied until we reach an average of at least 2,000.

Reflect for a moment on the volume of business awaiting us in the comparative new fields of Rural Electrification, Air Conditioning, Water Heating and Highway Lighting.

Although refrigerators have reached a 40 per cent saturation nationally, ranges and water heaters are only used by 11 and 4 per cent respectively of the industry's customers. In the West our refrigeration saturation is slightly below the national average and on ranges and water heaters we are ahead. We must admit that the surface has only been scratched in this field. Although it is only four years since the sodium lamp was introduced it has alalready revolutionized highway lighting. Imagine what it would mean to our industry if only 10 per cent of the nation's arterial highways were illuminated, and this is not an impossibility. The load to be secured from farm electrification is only limited to the ingenuity of the engineer in finding new applications. These conditions are a challenge to the engineer and the salesman alike. Engineering advancement is the forerunner of successful load building activities and the future depends on the ability of those directing this great industry in interpreting the growing and changing demands of the public we serve.

Some Developments in Utility Engineering Nationally*

By J. O'R. COLEMAN
Edison Electric Institute

HEADWAY is being made in establishing insulation standards and coordinating these standards to the insulation levels of power systems.

To review the situation with respect to grounding, it must be remembered that the National Electric Code first prohibited, then permitted, then recommended and finally required grounding of secondaries. The American Water Works Assn. first permitted and then refused permission to ground to water pipes. A committee has been formed between the E.E.I. and the A.W.A. with representation on it from many other interested organizations to study the technical facts as to grounding to water pipes. Fifteen cases have been studied revealing many ramifications. Nothing definite has yet been found, and the chief generalization thus far is that electric companies will have to pay more attention to grounding and the water companies more attention to the kind of pipes used. For instance, soap has been found as a cause of depositing copper from copper pipes.

Left to right: J. O'R. Coleman, Edison Electric Institute, New York City; Paul Ashworth, Utah Power and Light Co., Salt Lake; Seth Bullis, California-Oregon Power Co., Medford, and Carl Hoge, Puget Sound Power and Light Co., Seattle

The study of the use of bare neutral is continuing. If bare-neutral wiring can be used in old buildings, the capacity of the wiring can be approximately doubled without the necessity for installing new conduits.

The National Safety Code is to be revised and the cooperation of companies in the Northwest in this revision will be helpful.

Capital expenditures by the utility industry nationally have been chiefly for generation and distribution facilities. Expenditures for generation in the East have been largely in steam plants, rebuilding old units and superimposing new units. Hydrogen-cooled generators are finding increasing favor in this process of rehabilitating old plants. One of the advantages of these units, brought into focus by last year's floods, is that they are waterproof.

Distribution expenditures have been chiefly in rural lines. Multi-grounding is being employed more extensively.

* An abstract.

Stability Studies Permit Increased Power Flow

By C. E. CANNON
The Washington Water Power Co.

DURING 1936 and the early part of 1937 several major transmission line changes were made on the systems of The Montana Power Co. and The Washington Water Power Co. On the Montana system, these included the construction of a line to operate at 100 kv. from Thompson Falls to Anaconda by way of Flathead and Missoula. On the Washington Water Power system the line from Lind through Colfax, Pullman and Moscow to Latah Junction was changed from 60-kv. to 110-kv. operation. While these lines were under construction, it seemed desirable to determine what effect they would have on stability limits, voltages, power flows and distribution of reactive kva. between the interconnected power systems in the Northwest. The required data were obtained by setting up the interconnected systems on the alternating current calculating board of the Westinghouse Electric and Manufacturing Co. at East Pittsburgh, Pennsylvania.

The alternating current calculating board consists of a number of metal cabinets containing the following fundamental units:

Power Units

Each of the power units, which are used to represent generating stations, consists of a 3-phase, 100 per cent raise and lower induction voltage regulator and a 3-phase, 360 degree phase shifter with single phase output. By means of these units, the magnitude and phase angle of either the internal or terminal voltage of each generating station may be adjusted at will.

Line and Transformer Impedance Units

These units consist of variable reactors and resistors and are used to represent the impedance of reactors, transmission lines, cables and transformers.

Load Impedance Units

These units are similar to the line impedance units and when connected between line and the neutral bus are used to represent system loads at the various load centers.

Condenser Units

Tapped condensers are available to represent the charging capacity of cables and transmission lines. These same units may also be used for representing synchronous condensers in steady state stability studies.

Auto Transformer Circuits

Auto transformers with taps are used to represent tap changing transformers. These units are also used where systems of different voltages are interconnected through transformer banks.

By means of flexible cords and jacks, the above elements are readily connected to form a miniature single phase replica of the power system under consideration. A very ingenious metering panel may be connected into the circuit at any point by means of a metering plug. This metering equipment permits the measurement either of scalar voltages and currents or of their vectorial components with respect to any reference voltage or current.

The generating and transmission systems of the Northwestern Electric Co., Pacific Power & Light Co., The Montana Power Co., and The Washington Water Power Co. were set up on the calculating board in detail. In addition, the Portland General Electric Co. and the Puget Sound Power & Light Co. were represented by approximately equivalent circuits.

In all, twenty-two different load and stability studies were made of the interconnected systems for different conditions of transmission and generating capacity, loads and power interchange. For each study the magnitude and phase angle of voltages at all important points and the in-phase and quadrature components of currents in all lines were metered and recorded.

From the mass of data accumulated, the following three studies have been singled out for consideration in some detail since they give interesting data regarding stability limits of the interconnections between Northwest power companies:

Load Study No. 8

For this load study the system loads were as estimated by the various power companies involved for peak load conditions during January, 1937. Transmission facilities included The Washington Water Power Co.'s 110-kv. line between Lind and Latah Junction and The Montana Power Co.'s 100-kv. line from Thompson Falls to Missoula. Power flows and phase angles for some of the more important interconnections are given below:

Condit to Union Gap-Phase Angle *	14 deg.
Condit to Union Gap	16,400 kw.
P.P.&L. Co. to T.W.W.P. Co. at Hanford and Lind	1,700 kw.
Condit to Long Lake-Phase Angle	21.7 deg.
Vancouver to Long Lake—Phase Angle	25.3 deg.
P.S.P.&L. Co. to T.W.W.P. Co. at Chelan and Taunton	0 kw.
T.W.W.P. Co. to The Montana Power Co. at Burke	45,600 kw.
East Side to Rainbow—Phase Angle	72.8 deg.
Thompson Falls Generation	20,800 kw.

The power flow from The Washington Water Power Co. to The Montana Power Co. is very near the steady state stability limit as indicated by the phase angle of 72.8 degrees between the bus voltages at East Side and Rainbow substations. From theoretical considerations, the power limit under the above conditions is slightly less than 50,000 kw. However, the actual pull-out point is probably somewhat greater than this due to the stabilizing effect of the Milwaukee Railway synchronous motor-generator sets between East Portal and Gold Creek which could not be included in the calculating board set-up.

During March, 1937, with load conditions and generation and transmission facilities practically as set up for this load study, hourly peak loads as high as 44,000 kw. were transmitted through Burke to The Montana Power Co. In a 24-hr. period as high as 856,000 kw.-hr. were recorded, an average load of about 36,000 kw.

With 16,400 kw. flowing from Condit to Union Gap, the phase angles between Condit and Long Lake and between Vancouver and Long Lake are quite small. This indicates that it should be possible to operate satisfactorily with a considerably greater power flow between Condit and Union Gap. However, to realize the full benefit of this interconnection, it would probably be necessary to provide additional synchronous condenser capacity in the vicinity of Yakima to maintain voltage. Actually, during January and February, 1937,

† H. H. Schoolfield, Pacific Power & Light Co., Chairman; Pacific Power & Light Co., J. D. Herts; The Washington Water Power Co., C. E. Cannon.

* Where the expression "phase angle" is used hereafter, it refers to the difference in phase angle between the terminals under consideration.

hourly peak loads of 23,000 kw. or more were transmitted over this line.

Load Study No. 21

This load study was made using system loads as estimated by the several power companies for peak load conditions during January, 1938. Transmission facilities were similar to those for Load Study No. 8 with the addition of The Montana Power Co.'s line from Missoula to Anaconda. The following tabulation shows power flows and phase angles for some of the more important interconnections:

Condit to Union Gap.....	18,600 kw.
Condit to Union Gap—Phase Angle	16.3 deg.
P.P.&L. Co. to T.W.W.P. Co. at Hanford and Lind.....	800 kw.
Condit to Long Lake—Phase Angle	31.5 deg.
P.S.P.&L. Co. to T.W.W.P. Co. at Chelan and Taunton.....	49,800 kw.
T.W.W.P. Co. to The Montana Power Co. at Burke.....	59,400 kw.
East Side to Rainbow—Phase Angle	72.5 deg.
Thompson Falls Generation.....	16,100 kw.

The angle of 72.5 deg. between the bus voltages at East Side and Rainbow indicates that the systems are very near the steady state stability limit. This angle occurs in this study at a power flow approximately 14,000 kw. greater than in Load Study No. 8. This increase in power for the same angular difference is largely due to the line from Missoula to Anaconda, although the smaller generation of Thompson Falls has some effect. Taking into account the stabilizing effect of Milwaukee Railway synchronous motor-generator sets between East Portal and Gold Creek, it is probably safe to say that the steady state stability limit between The Washington Water Power Co. and The Montana Power Co. is in the neighborhood of 65,000 kw.

Transmission lines considered in this load study are now in operation and although the load conditions are not identical with those assumed, it may be interesting to examine the results being obtained. As much as 1,118,000 kw.-hr. have been transmitted through Burke to The Montana Power Co. in a 24-hr. period, an average of 46,500 kw.

Load Study No. 22

This study was a transient stability swing curve and is best described by reference to a draft of a memorandum prepared by R. P. Crippen, Phoenix Engineering Corporation which follows:

"In order that maximum reliability of operation of the Thompson Falls-Missoula-Anaconda line may be obtained, an investigation was made of the possibilities of 12-cycle carrier current pilot relaying and 30-cycle reclosing of this line before Flathead ** is in service. Such operation appears desirable.

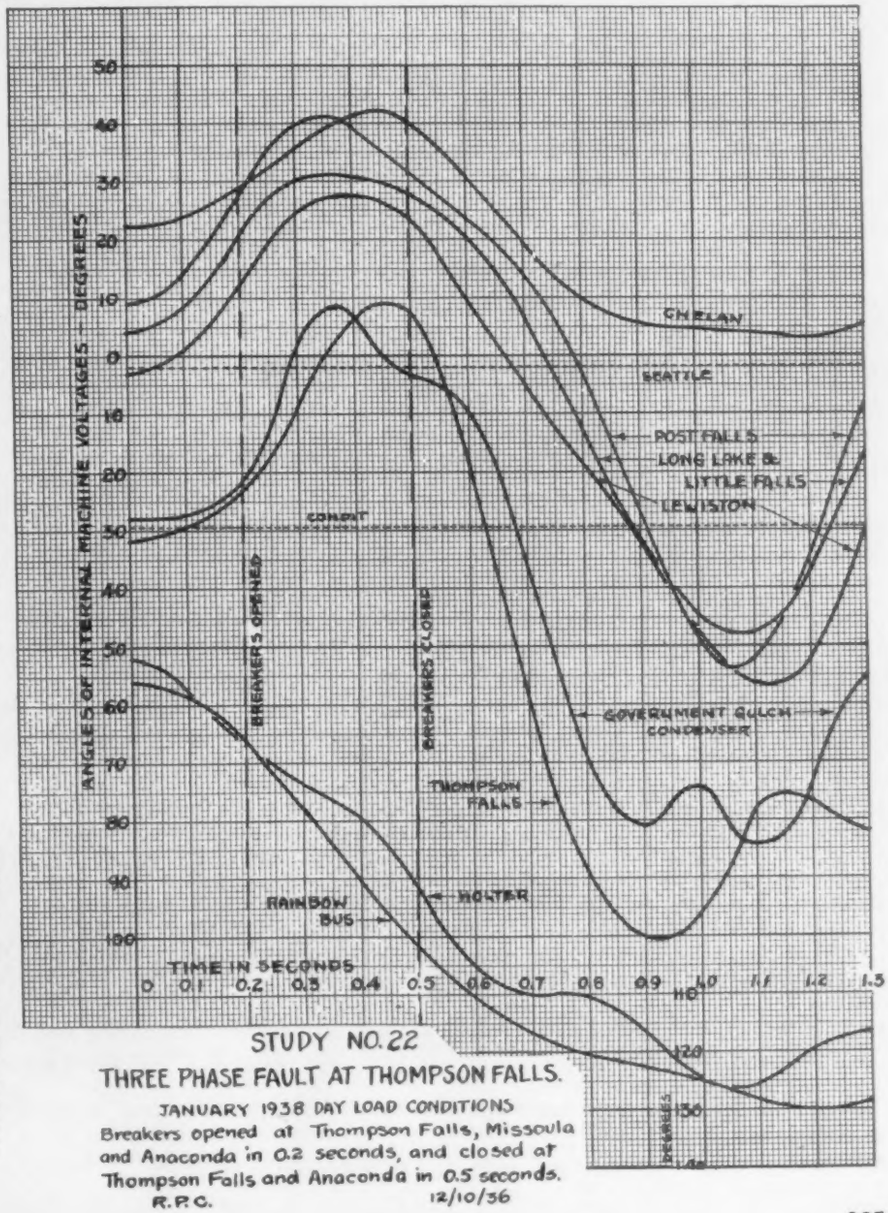
Transient stability swing curves were taken for the condition of a 3-phase short circuit with zero arc impedance on this line near Thompson Falls with the line assumed to open simultaneously at Thompson Falls, Missoula and Anaconda in 12 cycles and to close at Thompson Falls and Anaconda in 30 cycles after the occurrence of the fault. 40,100 kw. was being fed into Burke from The Washington Water Power Co. and Thompson Falls was generating 18,000 kw. The accompanying curves for this transient stability study shows that the systems remained stable.

The rapid reclosing of lines paralleling large systems is a recent innovation which has not been thoroughly tried out and it appears preferable not to recommend it unless it can be accomplished successfully under the worst conditions which may reasonably be expected to occur.

Various assumptions were made in deriving the swing curves for the condition. None of these assumptions were of major consequence in affecting the result, but each assumption made was pessimistic, rather than optimistic, in its effect on the stability of the systems.

Infinite buses were assumed at Condit and at Seattle. In other words, it was assumed that these points were so far from the fault at Thompson Falls that their movement in angle would be very small. Readings were taken on the

** New hydro project now under construction in northwest Montana.



Transient Stability Swing curve from stability study No. 22. The 110-kv., 3-phase fault at Thompson Falls Plant with Thompson Falls Plant generating 18,000 kw. and The Washington Water Power Co. delivering 40,100 kw. to The Montana Power Co. Load conditions as estimated for January, 1938 day loads. Oil circuit breakers opened at Thompson Falls, Missoula and Anaconda in 12 cycles to clear the fault and reclosed at Anaconda and Thompson Falls in 30 cycles. Systems remain in step due to rapid reclosing of the Thompson Falls-Missoula-Anaconda 100 kv. line. Without rapid reclosing the systems would pull out of step

generator units, representing these infinite buses, so that it could later be seen whether they would have had an appreciable effect if their angle had been changed. Calculations indicate that Seattle would have increased in speed slightly at the beginning of the curves and then would have slowed down to a greater extent as the curves progressed, the final position on the curves being twenty or more degrees nearer the Rainbow bus than the —2 deg. at which Seattle was carried. This would have drawn the various units on the system together a little more quickly than shown by the curves. Interchange to and from Condit, at which the generation of the Northwestern system was lumped, showed only small variations in power for the period studied.

Only the main generating units and synchronous condensers were carried. Small generating stations and motor generator sets were neglected. If the effect of the WR^2 of various smaller synchronous units had been considered, the stability of the systems would have been improved.

If the motor-generator sets of the Milwaukee Railroad, which are connected between East Portal and Gold Creek Tap, had been carried as synchronous machines, they would probably have had an appreciable effect in preventing voltage sag along this line under surge conditions thereby having a favorable effect on the results by helping the interchange of synchronizing current.

The fault condition assumed was a 3-phase fault at the Thompson Falls bus. No allowance was made for any arc resistance. This appeared to be the worst fault condition that might exist. Under this condition there was zero voltage between Thompson Falls and both systems during the fault. It will be seldom that a 3-phase fault with zero arc resistance will occur, and it also will be seldom that a fault will occur on the line immediately adjacent to the station.

The condition of loading on the system was chosen as a heavy one since this gave large initial angles between various machines, and consequently was a more difficult condition under which to have them remain in step. Readings were taken until the generators on the Rainbow bus actually reversed their angular movement relative to the other interconnected machines, which definitely indicated that they would come back into step with the rest of the system.

The results show that rapid reclosing on this line will save the systems from going out of step when a fault occurs on this line. Without rapid reclosing, operating experience indicates there is little doubt that the systems will go out of step.

It is realized that this paper does not by any means cover the subject fully. Even the detailed data on the twenty-two load studies made during the time the systems were set up on the a.c. calculating board did not answer every question. However, this paper may give the reader a better understanding of the steady state and transient stability limits of the systems in the Northwest, and of the value of the a.c. calculating board in solving problems of stability, line regulation and load control.

Discussion

By JOHN BANKUS

THE alternating current calculating table is a comparatively recent development and has been found extremely useful for solving many problems in the design and operation of transmission systems.

The value of the alternating current board can best be shown by making a few comparisons between it and the more conventional direct current board.

The d.c. calculating board was first used for making short circuit analyses involving three-phase faults. Such studies were found particularly valuable for determining oil-circuit-breaker requirements and the mechanical stresses on conductors and supports. The results of such studies were also used for relay applications involving three-phase faults.

More recently, by making use of symmetrical components, it has been possible greatly to extend the applications of the d.c. calculating table. It is now generally used for solving short circuit problems involving line-to-line, single-line-to-ground, and double-line-to-ground faults.

The d.c. board is, nevertheless, still very limited in its application when compared with the possibilities of the modern a.c. calculating table. With the d.c. board, it is necessary to assume that the internal machine voltages are equal and in phase. With the a.c. board, these assumptions are not necessary. Also, the a.c. board is more accurate since it takes into account resistance, reactance and capacity of the system, whereas the direct current board usually considers reactance only.

The a.c. board is especially adapted for solving problems involving voltage regulation and load control, and for making steady state and transient stability studies, such as are described in Mr. Cannon's paper.

H. V. Carpenter stated that the electrical engineering department in Washington State College is setting up an a.c. calculating board to simulate the interconnected systems in the Northwest with the new Federal plants connected thereto to demonstrate the use of this board in system stabilization.

E. A. Hamilton—In the interconnection between The Washington Water Power Co. and The Montana Power Co. for transfer of power eastward from the Burke Substation to the Moroni Plant, the relays at Burke are set to go out at 51,000 kw. Sometimes the swings are so sudden that the governors at Moroni, where there is automatic control, won't pick up the load. When the danger point is reached at Burke, the operator calls the Moroni operator, who picks up more load thereby avoiding a kick-out of the relays at Burke. There used to be several outages a day whereas now, outages do not average once a week. This is a case of automatic operation aided by a close watch by operators.

J. H. Siegfried and O. L. LeFever discussed troubles arising from the tie between Portland General Electric and Northwestern Electric in Portland affecting the system of Pacific Power & Light in central Washington, resulting in voltage and radio reception complaints on the latter. This happened only when Northwestern Electric was attempting to send large blocks of power in either direction from the Condit station.

Carrier Communication Over Distribution Circuits*

By J. D. HERTZ
Pacific Power & Light Co.

* To be published in July issue.

Electrical Features of the Bonneville Project*

By L. E. KURTICHANOF
Fellow, A. I. E. E.

IN THE design of electrical features of the Bonneville Project, problems were encountered such as rarely, if ever before, have been met in any power development. These problems, although simple in statement, were not susceptible to solution either by academic analysis or deeply scientific process. A power plant is to be built. How shall it function? Where is the load to be served? The authority granted was merely to build a power plant, incidental of course to a much needed improvement to navigation, at an approximate location on the Columbia River.

Office design and field construction work were initiated practically at the same time with the aid of such preliminary plans as were made some years earlier by the Corps of Engineers, U. S. Army, in their study of the resources of the Columbia River.

The location, size and nature of the load to be served was seemingly thought to be of but little importance and is no better known today than it was more than three and one half years ago when actual work in the field was started.

Gradually, the shaping of plans for the powerhouse structure took place but with hydraulic considerations dominating to an extent which all but ignored need for the accommodation of associated electrical equipment, other than the generators, equally necessary for the proper functioning of a power plant. Small recognition was given to the fact that different operating schemes required different types of equipment, different space accommodations and differences in an infinite number of details—all of which must necessarily be worked out well in advance of related construction to ensure proper coordination in the finally completed plant.

Meanwhile, construction was being pushed along on fast schedule, the only objectives apparently being the dumping of yards of concrete and the placing of tons of steel. Structural design in the office was but a jump ahead of actual construction in the field. There was constant demand for location and arrangement of equipment, long in advance of anything like certain knowledge of even the type of equipment to be used; the exact location of embedded conduit runs was needed before even tentative plans of the major features of a comprehensive operating plan were adopted.

Numerous schemes of operation were studied in effort to find one which would best fit into the government's policy when adopted. Out of these studies was evolved the general scheme governing the present plan which in its major aspect involves generation at 13,800 volts and stepping up to 115,000 volts for transmission to centers of heavy load. Provision is made in the powerhouse such that by installing necessary equipment when needed, substantial loads in the near vicinity may be served at generated voltage.

Generators

The rating of the first two main units was determined largely by practical limitations of water wheel capacity. Since service to large loads at generated voltage was strongly advocated by some as being of prime importance in attracting large power using industries to the locality, careful consideration was given to the matter of generator voltage. Study was made of the relative merits of using 13.8, 22 and 34.5 kv. This study revealed, for this particular case at least, that 13.8 kv. was the most economical, which fact, coupled with the uncertainty as to probable demand for service at generated voltage, made its adoption appear quite logical. In connection with this study, it is interesting to note that while in this instance 13.8 kv. was found most economical, it was also brought out that in certain cases in European practice, notably in England and Belgium where it had been used a number of years, greater economy was claimed for 34.5 kv.

The two main generators rated 43,200 kw., 0.9 power factor, 13,800 volts, 75 r.p.m., 3 phase, 60 cycles, with directly connected main and pilot exciters are being furnished by the General Electric Co. at the contract price of $572,440 each, erected in place and subjected to complete tests including short-circuit and overspeed. The house-service generator rated 4,000 kw., 0.8 power factor, 2,400 volts, 257 r.p.m., 3 phase, 60 cycles, with directly connected main and pilot exciters is being furnished by the Electric Machinery Manufacturing Co. at the contract price of $61,473 erected in place and similarly tested.

All generators are provided with an enclosed ventilating system consisting of the conventional metal housing and surface coolers. Facilities for extinguishing fires in the windings will consist of carbon dioxide gas or similar equipment supplemented by water spray

MR. KURTICHANOF presented a comprehensive description of all electrical features at Bonneville, giving reasons for the adoption of type, size and rating of the equipment. Only a part of this paper is published below. The entire Bonneville project, including hydrology, dam and other structures, hydraulic features, electrical features, navigation facilities, and fishways is to be published by Electrical West near the end of this year when the initial development in the powerhouse will be practically ready for operation. In view of this prospective coverage by Electrical West, and because of space limitations the following sections are omitted: Transformers, auxiliary equipment, 13.8-kv., 115-kv., 2,400- volt and 480-volt switchgear, control switchboards, station lighting, station heating, spillway dam, navigation lock, and fishways.

Published herewith are the introduction, stating some of the problems met by Army Engineers in designing the project, the description of the generators to be first installed, and the tabulation of costs with suggested allocation of cost chargeable to power development.
—Editors.

† E. H. Collins, The Washington Water Power Co., Chairman; William S. Hill, Grays Harbor Railway & Light Co., Vice-Chairman; B. C. Electric Railway Co., E. E. Carpenter; The California Oregon Power Co., Harry Olson; Eastern Oregon Light & Power Co., O. D. Lanning; Idaho Power Co., H. L. Senger; The Montana Power Co., Mr. Stussy; Northwestern Electric Co., O. L. LeFever; Pacific Power & Light Co., J. H. Siegfried; Portland General Electric Co., A. H. Greisser, R. F. Miller; Puget Sound Power & Light Co., A. L. Pollard, George C. Sears; Utah Power & Light Co., B. E. Gordon; The Washington Water Power Co., W. A. Hill, James McNair.

* A paper prepared for Power Production Committee, Engineering and Operation Section.

This exact model of the Bonneville Project, on display at headquarters in Bonneville, gives a comprehensive picture of the vast extent of the works being carried on there. Eventually, ten 43,200-kw. units are to be installed. Kaplan turbines permit efficient use of water at variable head experienced on the Columbia at this point

nozzles arranged to cover the end turns of the stator coils and the air-gap. Class B insulation is required for armature and field windings of all generators.

Each generator will be provided with a thrust bearing and an upper and lower guide bearing. Two guide bearings were specified on account of the unusual over speed requirements. The overspeed possible under the worst conditions reaches 288 per cent of normal speed. The thrust bearings for the 43,200-kw. generators will be required to support a total load of 2,843,000 lb. each. They are the General Electric Co.'s spring-supported type. The thrust bearing for the 4,000-kw. generator is the Kingsbury type. The rotating part of a main generator will weigh 775,000 lb. and will have a fly wheel effect of 113,000,000 lb.-ft. squared. The total weight of a generator is 1,500,000 lb. The shaft of the main generators is 40 in. in diameter and has a hole 15 in. in diameter bored axially throughout its length for the accommodation of the oil pressure pipe lines from the Kaplan head to the blade adjusting mechanism.

Excitation for each main generator will be furnished by a main exciter rated 375 kw., 250 volts and a pilot exciter rated 17 kw., 250 volts. No spare exciter is being provided. An automatic voltage regulator of non-continuously vibrating type is being furnished with each generator.

Project Costs

The latest estimates of cost to complete each of the major features of the Bonneville Project for the initial development of two units are as follows:

1. Dam and reservoir	$28,085,000
2. Buildings and grounds	976,000
3. Navigation lock	5,158,000
4. Fishways	6,553,000
5. Power house and equipment	10,218,000
Total	$50,990,000

For the purpose of establishing rates for the sale of power, allocation of project costs to power have been suggested as in the following table; remainder of costs to be charged to navigation:

1. Dam and reservoir	50%	$14,042,500
2. Buildings and grounds	50%	488,000
3. Navigation lock	0%	
4. Fishways	50%	3,276,500
5. Power house and equipment	100%	10,218,000
Total cost, 2 unit power plant		$28,025,000

Assuming that development is made, by increments of 2 units each until the ultimate of 10 units is reached, total and unit costs per kw. of installed capacity will be as follows:

Number of units	Installed capacity, kw.	Total cost	Unit cost
2	86,400	$28,025,000	$325
4	172,800	32,525,000	188
6	259,200	36,625,000	141
8	345,600	42,675,000	127
10	432,000	47,075,000	109

Round-Table Discussion Of Hydraulic Governors

E. H. COLLINS opened the discussion by describing the action of a hydraulic governor, pointing out that each governor has a different sensitivity, defined as the degree of speed change required to activate the turbine gates, and a different dead time, defined as the time that elapses from the initial speed change to the first movement of the gates. Further each water wheel installation has a different response of power to gate movement, with short water columns susceptible to quicker regulation than long water columns.

He also brought out that frequency control raised other problems affecting governor operation. With frequency controlled on two or more systems by one system, it was found that the frequency control system took load swings on all systems making it difficult to control tie-line loadings between systems. One scheme that has been tried for controlling this tie-line loading is a comparison of phase angle between two systems, which transmits impulses to a governing plant on the system which does not control frequency.

A study of the relative speed droop adjustments on the frequency control station and the other stations on the system, disclosed that a small change in frequency causes a larger change in load. Casual observation revealed that the various units were apparently not hunting, but if the units were watched for a period of time, a creeping up and down of load could be noticed. It is planned to reduce this by coordinating a set of speed droop adjustments over the system.

Power surges that might be eliminated are wasting generating capacity, it was said. Possible solutions suggested were adjusting present governors, replacement of present governors with new modern governors.

Participating in the succeeding discussion were O. L. LeFever, Tom Perry, G. C. Sears, R. F. Miller, J. H. Siegfried, R. S. Daniels, W. A. McCoy, G. W. Miller and H. M. Moon. Practices respecting the adjustment of governors on the various systems were told. Some companies operate their hydro plants on a base-load basis, taking fluctuations on the steam plant. Others do the opposite. Some use a blocking device on their base-load plant. Consensus was that old type governors are not susceptible of adjustments that will accomplish much improvement, but that the newer governors in the newer plants should be adjusted by a cut and try method to see if improvement can be effected.

A. N. Geyer told of the new-type governors to be used at Bonneville which will be sensitive to 1/100th of one per cent.

Isolated Plants for Small Towns

By C. P. ELIOT
West Coast Power Company

IN THE northwest region, a rapid trend toward transmission system interconnection plainly spells the elimination of practically all isolated plants within the very near future. Excluding municipal operation, a recent study reveals but twenty-one truly isolated plants in operation in small communities. In the interest of brevity, the example of three operating companies with isolated plants may be considered typical.

Ten years ago, these three companies operated twenty totally isolated plants in as many communities. Eleven of these were hydro plants, one was a diesel with hydro auxiliary, four were diesel exclusively, and four were served by industrial plants.

Today, seven of these plants have been connected with major transmission systems, six have been interconnected by means of minor transmission systems, and seven of the original twenty are still served by totally isolated equipment. The dependability of hydro plants is indicated by the fact that all but one of the eleven original plants are still in operation, although but two have survived without the need of auxiliary power from other sources. All of the four exclusively diesel plants now are used only for standby.

The now remaining seven isolated communities are served as follows:

2 by single unit hydro plants
2 by industrial plants
3 by combined hydro and diesel installation.

Why have these seven plants survived the trend of the times? Is it because of geographic location, or inherent advantages of operation? In the case of the two isolated hydro plants it is clearly both, the communities being considerable distance from any existing power lines and blessed with an ample supply of year-round stream flow at sites reasonably close to the center of town.

In the case of the two communities served by industrial plants, the effect of geographical location cannot be minimized but nevertheless there is a preponderance of advantages in utility service, as compared to the inherent disadvantages, as to carry in itself considerable weight. Industrial plant power in this area is synonymous with sawmill power. Among the outstanding advantages of industrial plant power are an ample supply, low cost (usually below the cost of power offered from transmission lines), incremental costs well below the operating increment in a diesel engine of any size, the absence of demand charges in the purchase rates because the utility requirements are but a small fraction of the total generating capacity for mill operations with community peaks occurring at offpeak times on the plant proper, and, finally, stabilization of the community. This last advantage may sound strange but it has been definitely proven through the recent depression that several sawmills have been able to continue operation through the revenues obtained from their services as a power company. This has maintained employment for the local population and enabled the power

company to retain its customers, a very good illustration of the circulating value of money.

Disadvantages of this form of power supply are principally from the service angle. While the fire risk is admittedly high, the experience of the past ten years has not shown even a minor fire to have occurred in an industrial power plant serving a community. The sawmill management usually looks upon the utility as of comparatively small importance. Frequency and voltage are materially impaired by large fluctuations in demand within the mill itself. However, regulators and the training of operators to maintain frequency within reasonable limits permit reasonably good service to be obtained.

Of the three isolated communities now being served by diesel engines, all originally were served by hydro power. Diesel engines entered the picture when the growth of the community exceeded the possibilities of further economic hydro development. The survival of all three plants as isolated systems is due largely again to geographical location, but real economy of operation has been enhanced by the existence of water power units which have enabled more efficient loading of the engines during their hours of operation.

While authorities consider that the day of isolated diesel plants for utility generation is over, diesel power has been of great service to the utility field and even today is doing excellent duty where cheaper power is not available. However, the real economies of diesel operation do not appear in the utility field. They show themselves at their best in industrial applications where constant loads of predetermined size permit operation at maximum efficiency, and the elimination of attendant or labor cost by the use of operators whose time is largely charged to other duties. Under such circumstances, the diesel offers real competition to the central station service. All companies should be on the alert to make sure that the hard won industrial load is not lost because the customer was not acquainted with all of the facts before making decision on the type of power he is to use.

This paper is not considered the subject of municipal operations even though many municipal and REA installations talked of at the present time are predicted on the use of diesel power. Everything needed to refute the claims and statements of such operations is contained in technical literature of the electrical industry, and in the ability of public service companies to give constantly lowered cost service as demonstrated by the continuous rate reductions placed in effect even during depression years.

Increasing the Capacity of the Northwest's Largest Boiler*

By RUSSELL F. MILLER
Portland General Electric Co.

* Published in January, 1937, issue of *Electrical West*.

Methods of Protection Against Oil Fires

By O. L. LeFEVER
General Superintendent
Northwestern Electric Co.

MINIMIZING the hazards of oil fires, providing adequate equipment for fighting them should they occur, and training employees in effective methods of using equipment are sound insurance against lengthy service interruptions. The executive, engineering and operating departs each have definite responsibilities in this matter. This paper will attempt to consolidate in one place, and make available for all employees of the member companies, reliable information developed by field practice, engineering study and research on the subject of oil fires and fire-fighting equipment. For clarity and conciseness, the data are segregated into six classifications, each of which is taken up in detail below.

1. Design and Installation

It is recognized that in the design of an electrical installation careful consideration should be given to the possibility of oil fires. The recommendation and/or suggestions submitted herewith point out the salient features which should be considered. These suggestions are intended to point out desirable design practices for new installations. When old installations are to be reconstructed these suggestions may well be reviewed and such of them as are necessary or practicable may profitably be adopted.

(a).

Segregation

Proper physical separation and isolation of equipment is of primary importance. In all such cases, all oil filled equipment should be so located as not to endanger the total installation, which might result in excessive interruption to service.

Where reasonable distance separation is not feasible, segregation by means of substantial fire wall barriers is effective. In those instances, segregation is desirable between individual items of equipment, as well as between such equipment, adjacent structures, and the installation as a whole.

It is desirable to minimize all openings and interconnections between adjacent parts of the installation.

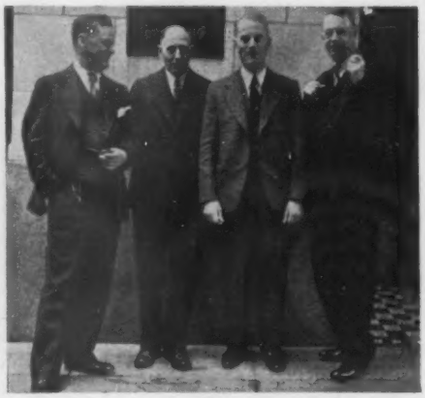
Routing of cables, conduits, mechanical pipes, operating rods, etc. should be considered from this point of view as potential fire transmitting media. Where essential, exposed cables and in some instances the conduits should be fire-proofed. Large conduits might profitably be plugged at one end where permissible.

Where necessary to locate large oil-filled containers or oil-filled electrical equipment at elevations above other equipment, it is desirable to give particular attention to safety directing flow of oil away from equipment underneath it in the event of leakage due to accident or otherwise.

Inasmuch as in cases of fire, immediate de-energization and isolation of the equipment is essential, fire possibilities constitute along with electrical failure possibilities, a vital factor in the scope of the system's protective scheme. In large and important installations, fire indication should be included along with electrical failure indication in the protective system.

Proper isolation can best be applied to outdoor installations, yet here, as well as indoors, total economy should not be lost sight of. Segregation by means of fire walls, barriers, fire doors, etc. and accessibility to equipment for fire-fighting purposes, is a function of the economy of the project as a whole, and the designer must follow that principle to avoid extremes of application.

Practices of economy may prohibit isolation or segregation of individual items of equipment in large indoor installations. Group isolation or segregation presents a feasible and economical means of localization of fires in such instances.



Ed Des Camp, Graybar Electric Co., Seattle (left) congratulates the Portland Convention Committee for a fine meeting. O. L. Le Fever, Northwestern Electric Co., had charge of inspection trips; Charlie Osborne, Portland General Electric Co., was transportation chairman; and, at the right, Harry Schoolfield, Pacific Power and Light Co., was general convention chairman

(b).

Oil Confinement and Oil Disposal

Where oil-filled equipment is installed close to a building, it is desirable that it be located away from windows or other direct openings above or adjacent to the equipment.

Doorways and openings leading into compartments containing oil-filled equipment should be fitted with fire doors and provided with sills of suitable height to prevent overflow of oil.

In the design of compartments, due consideration should be given to ventilation, not only from the standpoint of dissipating the heat normally liberated by the equipment, but also to prevent accumulation of explosive gas mixtures and smoke. In large installations the practicability of installing suitable special emergency ventilating equipment to remove smoke and gas may be found desirable.

Openings in the floors of compartments containing oil-filled equipment should be avoided where practicable. Necessary openings, conduit trenches, ventilating ducts, drains, etc. should be designed so that they will not conduct burning oil, flame and gases to other parts of the station or substation.

Heating pipes, heating equipment, etc. when installed around or near oil-filled apparatus, should be so constructed, lagged and/or shielded that oil cannot fall onto or be sprayed thereon. Care should also be taken that no heating equipment be so located as to become a potential source of oil fires.

It is not always desirable to drain the oil from burning equipment. However, draining facilities are usually provided for removal of oil when conditions are such that this procedure becomes necessary.

Such drainage systems should be ruggedly constructed avoiding pressed or soldered joints in the piping. Where motor operated valves are installed, the motor and the connections to the motor should be protected so as not to be inoperative in an emergency. Such valves should also be capable of being manually operated.

Experience has shown that beds of washed gravel or crushed stone of suitable depth, suitably placed under and around oil-filled equipment, will be effective in extinguishing fires from burning oil. The gravel or crushed stone should preferably be of size which will not quite pass through ¾-inch mesh screen. Fine crushed stone or gravel should not be used for this purpose. Perforated oil pipe drains should be placed under the gravel.

(c).

Fire Detection

Where necessary and practicable, particularly with respect to large oil-filled equipment, the use of alarms by contacts of thermal or pressure devices will give warning to attendants of excessive temperature in the equipment.

2. Selection of Electrical Apparatus and its Arrangement

In the selection of electrical equipment consideration should be given to the amount of oil contained in the equipment as having a bearing on the possibility of fires. Other things being equal, the equipment with smaller amounts of oil should be preferred.

Particular attention should be given to the mechanical strength of oil-filled equipment and appurtenances for resistance to rupture in case of internal failure. This applies especially to joints. Pressed or soldered joints in the oil piping should be avoided.

In metal clad switchgear, oil-filled buses and other equipment, where practicable, a reasonable division should be made by means of stop joints to separate the volume of oil in order to limit the loss of oil in case of rupture. Means should be provided on large oil-filled equipment for the relief of pressure in case of internal failure. These devices should be so designed as to prevent ejected oil being thrown on adjacent equipment. In some instances it may be desirable to provide remote operated valves for draining equipment. In such cases it may be more convenient to have such valves as an integral part of the piece of equipment. The use of mechanical or pressure type oil gages instead of gage glasses will often be found preferable.

Consideration greater than that given in the past should be given to the dielectric strength and thermal capacity of smaller oil-filled equipment, such as instrument transformers. Recent experiences have indicated the desirability of using a mechanical or magnetic gage to indicate oil level in the conservator tank of large transformers; or if gage glass is used, to surround this in such a manner with metal shield that an arc from trans-

former terminal to conservator tank will not burst the gage glass and permit oil to leak out.

Should it be found necessary to drain off the oil from a burning transformer it is desirable to fill the vacated space in the transformer with inert air or gas to limit the severity of the fire and damage to the windings.

3. Oil Piping

The following precautions and practices are suggested with respect to oil piping, pipe joints, gages, etc.

(1) Arrange piping to that it may be readily inspected and maintained.
(2) Sizes one inch and under should be heavier than standard weight pipe.
(3) Use pipe bends and welded joints wherever possible.
(4) When flanged joints are necessary, use steel flanges with oil-proof gaskets. When flanges are used in pressure lines, use recessed or male and female steel flanges. Means should also be provided for securely locking bolt heads and nuts of oil line flanges.
(5) All small piping which might be struck by other equipment should be guarded.
(6) Suitable steps and grab handles should be provided to prevent abuse of oil piping.
(7) Where oil lines pass close to hot steam lines, the steam lines should be lagged.
(8) When threaded pipe joints are used the joint should be reinforced by welding to maintain the equivalent of the original pipe wall thickness.
(9) Unions in small pipe connections should be of steel of the ground joint type.
(10) No connections smaller than one-half inch pipe should be made to main oil lines. Such small connections should conform to suggestions for piping joints and should consist of short nipples with shut-off valves as close to the connection as possible. If these connections are used for pressure gages they should have restricted openings.
(11) Copper tubing with cinch fittings may be used for gage connection beyond the shut-off valve. Gages should be supported independently of their connecting pipes.
(12) Main oil lines should be constructed of standard weight steel pipe, or heavier, or seamless steel tubing of equal wall thickness with extra heavy steel flanges and steel fittings.
(13) Gage glasses should be avoided wherever possible and mechanical, pneumatic or electrical indicators used.

4. Fire Hazard from Steam Turbine Lubrication Oil

A serious fire hazard exists when steam turbine lubricating oil comes in contact with high temperature steam lines. A check of twelve representative turbine oils shows flash points ranging from 330° to 435° F. and fire points from 380° to 495° F. The corresponding figures for "D. T. E. Light", which is quite commonly used, are 400° and 445° F. respectively. With steam temperatures well above these figures now in regular practice the hazard is self-evident.

In order to minimize the hazards of turbine oil fires as much as possible, the Ebasco Services, Incorporated, in 1932 made the following recommendations to their member companies:

(1) Set up a routine schedule for inspection of all oil lines, reservoirs, purifier equipment, governor mechanism and other apparatus filled with oil. Renew gaskets, stuffing box packing, etc., as necessary to insure safe operation.
(2) Replace all screwed cast iron companion flanges of 125 lb. ASA Standard dimensions, with wrought steel flanges or with 250 lb. ASA Standard cast iron.
(3) Replace cast iron flanged or screwed fittings of 125 lb. ASA Standard in locations where subject to vibration or misalignment stresses, using 250 lb. ASA Standard cast iron

TABLE NO. 1

Type	Tetrachloride	Soda-Acid	Foam	Carbon Dioxide
CHEMICALS EMPLOYED	Carbon Tetrachloride with important components for depressing freezing point, avoiding corrosion, etc.	Bicarbonate of Soda Sulphuric acid.	Aluminum Sulphate—Bicarbonate of Soda with Foaming Agent.	Commercially pure liquid carbon dioxide free from moisture, etc.
METHOD OF OPERATING	PUMP	INVERT	INVERT	OPEN VALVE
METHOD BY WHICH PRESSURE IS CREATED	PUMPING ACTION	CHEMICAL REACTION	CHEMICAL REACTION	PRESSURE STORED IN CYLINDER
EFFECTIVE RANGE OF STREAM	20 ft. OR MORE under full pump pressure	30 to 40 ft.	30 to 40 ft.	6 to 8 ft. under full pressure
RATED LIQUID CAPACITY OF MOST COMMON SIZE	¼ GALLON	2½ GALLONS	2½ GALLONS	15 lbs.
QUANTITY OF PRINCIPAL EXTINGUISHING AGENT PRODUCED	Quantity variable—depends upon amount of liquid which comes in contact with heat of fire.	2½ GALLONS	20 GALLONS	Quantity variable—about 135 cu. ft. of gas at normal temperature.
NATURE OF PRINCIPAL EXTINGUISHING AGENT	FREE GAS produced when liquid is vaporized by heat of fire.	LIQUID soda solution	FIREFOAM a mass of bubbles filled with carbondioxide gas.	FREE GAS produced when liquid is released from cylinder.
PRINCIPAL EXTINGUISHING EFFECT	BLANKETING	COOLING	BLANKETING	BLANKETING
Class A Fires Wood Textiles Rubbish, Etc.	NO Other types are better adapted for Class "A" fires. This type good under most favorable conditions because of:—small size, difficulty of confining gas at seat of fire; force, range, and duration of stream not automatically assured; operator cannot devote entire attention to directing stream on fire; must be used with caution in small rooms.	YES for use in places not involving oils, greases, etc., in any way. Must be kept in heated cabinet when installed in places subject to freezing temperatures.	YES—BEST AVAILABLE for use in all places involving Class "A" fires because of desirable characteristics not possessed by any other extinguishing agent (fireproofing effect; smaller wetting effect, etc). Must be kept in heated cabinet when installed in places subject to freezing temperatures.	NO Other types are better adapted for Class "A" fires. This type good only under most favorable condition because of difficulty of confining gas at seat of fire, short range of steam, not useful on overhead fires.
Class B Fires Oils, Greases, Etc.	YES but foam type is better for Class "B" fires. This type good only under most favorable conditions because of:—small size, difficulty of confining gas at seat of fire; force, range and duration of stream not automatically assured; must be used with caution in small rooms.	NO because it has practically no blanketing effect.	YES BEST AVAILABLE for use in all places involving Class "B" fires because of characteristics not possessed by any other type.	YES but foam type is better for Class "B" fires. This type handicapped by short range of stream. Difficulty of confining gas at seat of fire except under most favorable conditions.
Class C Fires Electrical Machinery	YES Satisfactory where fires have not spread beyond extinguishing capacity of extinguisher and especially in places where current is not likely to be turned off, because stream is a non-conductor.	NO except on low voltage when used with caution, or where current is likely to be turned off. Stream is a conductor but a poor one.	YES BEST AVAILABLE where fires have spread beyond the extinguishing capacity of tetracloride extinguishers and where current is turned off or is of low voltage. The stream is a conductor but a poor one.	YES BEST AVAILABLE where Class "C" fires have not spread beyond extinguishing capacity—stream is a non-conductor, has no wetting, no solvent effect and leaves no residue.
UNDERWRITERS RATING	B2—C2	A1	A1-BI	B1-C1

or preferably 125 lb. ASA Standard cast or wrought steel. Extent of such replacement will depend on judgment of the station personnel.

(4) Replace all gaskets containing rubber or of composition rendering them unsuitable for service with oil.

(5) Protect heat insulation with sheet metal jackets at points where unusual liability of oil saturation exists.

(6) Provide adequate facilities for fighting oil fires, following same general requirements as apply to fuel oil systems.

In case it becomes necessary to renew any considerable portion of the oil piping system, specifications for the piping are recommended as follows:

Pipe—Lap-welded full weight steel, or seamless tubing of equivalent thickness.

Joints—Fusion-welded of "V" type wherever possible. Flanged joints of Van Stone type with swivel flanges, or welding-flanges with necks for "V" type fusion weld, or screwed flanges. All flanges wrought steel Series 15 or 125 lb. ASA Standard.

Fittings—Flanged cast steel for 2½ in. diam. and over; wrought steel screwed for 2 in. and under. Unions used for ¾ in. and under only, forged steel with steel insert. "Tube-turns" or miter-joints with "V" type fusion welds to be used wherever possible in place of flanged or screwed fittings.

Valves—Cast steel for 2½ in. and over; all-bronze for 2 in. and under.

Gaskets—Asbestos with woven wire insert.

5. Fire Fighting

There is no way of extinguishing a fire except with an extinguishing agent having either a cooling effect or blanketing effect, or a combination of both. Nearly all extinguishers produce both effects, but some in much greater proportion than others. Table No. 1 shows the characteristics of commonly used extinguishing agents.

Portable extinguishers have limitations due to size. A small amount of extinguishing agent will be effective if applied at the time the oil fire starts, but if the fire has gained considerable headway the ordinary portable extinguishers will generally be found ineffective.

An ordinary stream of water played on the surface of boiling oil is worse than useless; since oil is lighter than water it floats up and causes the flames to spread. Likewise, sprinkler heads for other than an incipient fire are unsatisfactory. However, if water is broken up into a spray and driven forcibly against the oil surface in the proper manner it forms an oil emulsion, lowering the oil temperature below the flash point, and thereby becomes a very effective agent. For instance, an emulsion containing two-thirds gasoline and one-third water will not burn when a lighted match is applied.

An English company has developed apparatus for fighting oil fires designed on this basis, known as the "Mulsifire" system. The discharge nozzle delivers water in the shape of a cone driven at high velocity. When the water strikes the oil it creates a temporary emulsion incapable of burning. The projector is a truncated cone with an inner spiral, the function of the spiral being to impart a swirling action to the water, breaking it up into a uniformly distributed and forceful spray. The maximum distance these projectors can be spaced is six feet apart. The average discharge of water from the projector is approximately sixteen gallons per minute with a minimum flowing pressure at the nozzle of 40 lb.

Spray nozzles for fighting oil fires have also been developed in the United States. An Akron vapor nozzle was used very successfully in fighting a stubborn powerhouse oil fire at Newark, N. J., on Dec. 28, 1936. This spray nozzle was pressed into service after chemical fire extinguishers had failed to subdue the blaze.

Firefoam, which is very effective in fighting oil fires, operates by cutting off the supply of oxygen, necessary for combustion, with a thick air-tight blanket of bubbles inflated with harmless carbon dioxide gas. The discharge from a foam extinguisher is in volume ten times greater than the extinguisher contents.

The firefoam stream is a conductor of electricity, although a poor one. Firefoam does not have any of the limitations of those extinguishers, having a blanketing effect which employs a free gas. It coats vertical or horizontal surfaces with a heat-resisting layer that clings to the surface and prevents re-ignition. It floats on light as well as heavy liquids. Its heat resisting layer insulates surfaces against fire for a longer time than extinguishing agents which merely wet the surface and run off.

Foam for handling large oil fires is commonly produced by three different methods:

First, by use of two liquid chemical solutions stored in separate lead lined solution tanks of large capacity. The solution flows through separate lines of pipe or hose to the place where the foam is to be produced and is discharged through a common nozzle to the fire.

Second, by feeding a composite mixture of dry reacting chemicals to a steam of water flowing to a fire. The composite mixture when stored must be mixed with China clay, chalk or some inert filler to prevent decomposition.

Third, by feeding, simultaneously, separate inert chemicals in concentrated liquid suspensions which completely react to form foam in large volumes. In this system the dry chemicals are stored separately and require no fillers to prevent deterioration. This system is known as the"Foman" method.

In fighting a fire with foam the method employed with water spray should not be used. With foam, a blanket should be laid on the surface without agitating the surface any more than is necessary. If the surface is agitated the smothering action is delayed.

In case of a ruptured oil pipe or reservoir causing a rapid flow of burning oil away from the source of trouble a heavy foam blanket should be laid at the bottom of the stream of burning oil, so that the oil will pass in under the smothering blanket and thereby have its forward progress checked. *The first principle in fighting oil fires is to isolate the fire and confine it to as small an area as possible.*

Summary

Engineers and plant men are often tempted to install oil-filled apparatus down in a basement or sub-basement where space is available that has no particular utilization value. This is poor economy unless ample fire walls are provided, for if a fire occurs it is generally impossible to reach the seat of trouble without the use of a super gas mask.

There are many types of fire extinguishers on the market. No one class of extinguishers is a cure for all fires. Each has its good points and limitations. It is necessary for the engineer and plant superintendent to familiarize himself with the different characteristics of each and provide fire fighting equipment in accordance with the service to be rendered.

Economics of Industrial Power Plants*

By A. H. GREISSER
Portland General Electric Co.

THE relative economy of purchased power service vs. independent generation in an industrial plant can be determined only upon careful analysis of all factors involved. Expenditures for tests, investigations, and engineering studies before an industrial plant purchases power generating equipment will prove to be a good investment in the long run. Among the more important factors to be considered in evaluating data obtained from such studies are:

1. *Capital Investment*—Progressive inadequacy of one part then another of a power generating plant leads to continuous capital investment in the generating facilities far in excess of that originally contemplated by the management. For instance, electrical expansions may make the turbine and generators too small to carry the load. A new turbine and generator in turn will often require complete rebuilding of the boiler plant. If the load continues to grow, as is generally the case, excessive maintenance due to overloading power equipment and long shut-downs add to the expense of invested capital. In such cases, the fixed charges on the investment are high because of the fact of inadequacy.

2. *Depreciation*—Generating equipment, boilers, switchboards, and other power plant equipment are subject to high depreciation rates, many times not considered when the original decision to install the plant is made. This is particularly true because of the increasing economies of more modern equip-

* An abstract.

ment, and because of the factor of inadequacy as mentioned above. The effect of plant shut-downs to replace furnace refractory failures, burned out boiler tubes occasioned by high boiler ratings, new blading for turbines, etc., are seldom evaluated in any study made to determine the true economy of industrial power plant operation.

3. *Technological Changes*—The power plants of the Pacific Northwest offer one of the finest examples of technical obsolescence of power plant equipment that can be imagined. Independent industrial power plants rely chiefly on hog fuel in that area. The installation of power generating equipment is generally made on the assumption that hog fuel is a liability. Twelve years ago, hog fuel was a liability in that costly burners had to be maintained for its disposal.

Since that time, research has developed uses for waste wood products to such an extent that sawmill waste has become too valuable a source of revenue for the mill to be burned under boilers for power generation. For instance, in one year the mills sold 84,000,000 cu. ft. of spruce and hemlock chips (formerly burned) to pulp and paper mills for a cost of approximately $1,300,000. This sum was practically a net gain in revenue to the mills of the area. In addition to becoming a popular domestic house heating fuel, sawdust also is pressed into cylindrical logs for fireplaces, heating stoves and furnaces and as such it finds ready market at a price very much worth while to the sawmill operators. Wood waste subject to various processes is made into wallboard, insulating material, and a variety of other building products. Recent experimental work indicates the possibility of manufacturing wallboard from sanding machine dust, and other finely-divided particles. Sawdust also is especially treated in several places in the Northwest to become efficient insulation to be placed in the walls of homes, refrigerating rooms, etc.

As the value of waste wood products increases, the economics of hog fuel-burning, turbo-electric industrial plants become increasingly favorable for the use of central station service. Electric utility service has the important economic advantages of flexibility of supply. During times of industrial depression and low factory output, the fixed charges on a large industrial power plant are high compared to the cost of utility service. Furthermore power purchases can be accommodated to a change in load conditions without undue delay or additional investment. Additional data on isolated plant operation is being prepared by the author and will appear in these pages at an early date.

Codes Committee†

1937 Revision of N. E. C. as It Affects Utility Companies*

By M. T. CRAWFORD
Puget Sound Power & Light Co.

BECAUSE the entire Code was being rearranged under new chapters and article headings, the work of the Electrical Committee was unusually heavy this year. The following outlines some of the important changes affecting utilities other than the rearrangement in form.

Introduction

Under the heading "Purpose and Scope", the field of the Code was enlarged to include personal hazards as well as fire protection, making the first sentence read "The purpose of this Code is the practical safeguarding *of persons and* of buildings and their contents from electrical hazards arising from the application of electricity for light, heat, power, radio and signalling." This change was explained informally as being desirable in connection with a movement which is underway to revise the National Electrical Safety Code of the U. S. Bureau of Standards. It is proposed to omit part 3 of the National Safety Code which relates to inside construction and substitute the National Electrical Code therefor.

The last sentence under "Purpose and Scope" exempting power company installations was amended to provide that the Code does not cover "installations or equipment employed by electric and communication utilities in the exercise of the functions of those utilities". This change was made to prevent the exemption of wiring installations for light and power in gas plants, water pumping plants, railroad shops, etc. but permit exemptions of installations in power company stations and substations as well as telephone company exchanges. This is also interpreted to exempt installations on consumers' premises in approved enclosures under sole control of the power company and accessible only to authorized persons.

Article 100 Definitions

Of interest to power companies was the insertion of a revision of the definition for "service drop" to read "that portion of overhead service conductors between the pole and the first point of attachment to the building". Formerly this definition extended to the junction with the service entrance conductors and included wires attached to and running along the side of the building.

Article 210 Branch Circuits

A number of rearrangements were made classing circuits in accordance with ampere capacity. Under the heading "calculation of load in dwelling occupancies", a provision was passed substituting two watts per sq. ft. for the recommended three watts per sq. ft. as a basis for calculating the load on branch circuits in dwellings. This will permit less expensive wiring in small homes but will not prevent more liberal provisions in locations where the customer can afford it.

Article 220 Feeders

A major change was put through as a result of extended studies by the Edison Electric Institute affecting Table 18-B which prescribes the demand factors as a basis for the size of feeder copper for groups of electric ranges. Extensive tests were made on the actual feeder demand on electric range installations in homes and apartments by 22 different companies in various cities, five of which were in northwest territory. The Edison Institute made a composite of some 227 test reports and recommended material reductions in the demand factor provisions of the 1935 Code. As finally adopted by the Electrical Committee these recommendations were modified slightly in groups of ranges below 9 but a very satisfactory improvement obtained as shown in the following table. This applies to ranges of 3500 watts and over.

Number of Ranges	Demand Factor in Per Cent 1935 Code	E.E.I. Proposal	1937 Code
1	80	70	80
2	75	60	65
3	70	50	55
4	66	45	50
5	62	42	45
6	59	40	43
7	56	38	40
8	53	36	36
9	51	35	35
10	49	34	34
11–15	47–40	32	32
16–20	39–35	28	28
21–25	34–30	26	26
26–30	30	24	24
31–40	30	22	22
41–50	30	20	20
51–60	30	18	18
61 and over	30	16	16

Article 230 Services

The provisions of this article affect power companies' installation costs, as well as those of our customers. One problem was in connection with the installation of a range in a

† M. T. Crawford, Puget Sound Power & Light Co., Chairman; The California Oregon Power Co., S. M. Bullis; Eastern Oregon Light & Power Co., J. H. King; Grays Harbor Railway & Light Co., W. C. Kidder; Idaho Power Co., H. M. Jones; The Montana Power Co., F. W. Bird; Mountain States Power Co., G. McLellan; Northwestern Electric Co., S. B. Clark; Pacific Power & Light Co., R. J. Davidson; Portland General Electric Co., F. H. Murphy; Puget Sound Power & Light Co., R. E. Thatcher; Utah Power & Light Co., W. J. McMinn; Washington Gas & Electric Co., Robert Protheroe; The Washington Water Power Co., L. R. Gamble; West Coast Power Co., M. V. Watson.

residence already wired for lighting. In certain areas in our territory by special permission we have been installing a new serivce entrance cable and meter on the outside of the building with service equipment for the range load, with two conductors run back from the meter and picking up the existing open wiring on the side of the house to the existing outlet and service entrance for lighting. This violates the 1935 Code which forbids open wiring between meter and service equipment and inspectors have recently been forbidding such installations, which required an entirely new service entrance equipment for both lighting and range. I submitted two amendments which were prepared at the meeting of the Code Committee in February and secured their adoption as follows:

Section 2302—One Set of Service Conductors Only

A new sub-paragraph c added as follows: "In a single occupancy where a set of service entrance conductors is already installed for one class of use, one additional set may be installed for a different class of use".

Section 2375—Relative Location of Over-current Device and other Service Equipment.

Sub-paragraph b. There shall be no open wiring between the meter and the service equipment. Added a new sub-paragraph b-4 as an exception to the above, reading as follows:

"Where an additional set of service entrance conductors is installed in conformity with 2302 C or where a meter is connected ahead of an existing service head or outlet, conductors on exterior of building more than 8 feet above ground connecting to the existing service head or outlet, may be installed by new wiring method specified in 2331—for Service Conductors".

A number of other small changes were made. The proposed section 2307 covering Service Conductors without Splice was reworded so as to include service entrance conductors only which eliminates the power company's portion of service conductors from the pole to the connection with the service entrance.

In Section 2351 covering the disconnecting means, the Article Committee had proposed to delete the word "entrance" from the provisions of the section making it apply to service conductors (which extend all the way from the pole to the main switch). We secured the re-instatement of the word "service" making it apply to service entrance conductors only, and made corresponding changes in the balance of the section. In the opinion of the Article Committee Chairman these changes would take care of the situation in which our Code Committee was interested, in connection with multiple occupancy buildings having no common space readily accessible for grouping the service entrance equipment.

Section 2371—Over-current Protection

This was changed to apply to service entrance conductors instead of the complete service conductors and other changes in the sub-paragraphs to match with previous amendments.

Article 240—Over-current Protection

The proposals of the Article Committee were accepted with a few changes. The principal change was in the failure to approve the proposed sub-paragraph-d Section 2434 regarding taps not over 25 feet long. Inspectors had proposed to restrict the use of unprotected taps of less than 25 feet to industrial occupancies and inaccessible locations.

Article 250 Grounding

The Article Committee report was accepted in the main with some minor adjustments in connection with the grounding of current and potential transformer circuits.

Article 300—General Requirements for Wiring Methods

The use of "CNX" cable in which the neutral conductor is covered but not insulated has heretofore been approved for trial use only and an effort was made by the manufacturers and power group to obtain the necessary amendment to approve this cable for wiring in single family residences. This was opposed by the contractors and some of the inspectors. When finally put to vote we lacked only three votes of getting the necessary two-thirds majority. No action was taken, however, toward eliminating the provision authorizing trial installations under local approval.

Article 328—Service Entrance Cable

Section 3283 was amended to permit the use of this type of cable where a circuit is to be run out of one building for an overhead extension to another building.

Article 450—Transformer and Transformer Vaults

Considerable discussion arose over the Section 4532 proposal to require fuses rated at not more than two amp. in the primary circuit of all instrument potential transformers. Power company men maintained that such fusing was impracticable on higher voltage installations and as finally passed the word "shall" was replaced with the word "should" making it a recommendation instead of being mandatory.

Many other important changes were made in the Code in regard to interior wiring methods and other matters not directly affecting power companies' construction, but having a bearing on the cost of our customers' installations. Among these changes was a new method for classifying circuits on an amperage basis which is felt to be a distinct improvement. The use of service entrance cable was extended to certain types of interior wiring if made up of rubber covered conductors, which may be helpful in reducing the cost of wiring around farms.

Future Revisions

Among the matters that have already come to attention is the limitation of 150 volts to ground which is found at a number of places in the code and applies to various methods and materials. A number of member companies make a practice of serving both light and power from the same delta connected transformer bank with the lighting on one phase. This results in a 240 volt 3 service and if the neutral is brought out from the mid-point of one of the phases to provide a 3 wire single phase lighting, the result is 208 volts to ground from the fourth power wire. We are preparing data to show the need for a revision in this requirement in order that special wiring may not be necessary under such conditions.

New Types of Wiring Assemblies

By S. B. CLARK
Northwestern Electric Co.

SINCE the Wiring Committee's report to the Section's 1936 meeting at Spokane, there have been no new developments in wiring assembly specifications. Available wiring assemblies that have a direct effect on utility activities, especially where and when range and water heater campaigns are conducted, can be summarized as follows.

There are four standard types of service entrance cables produced by wire manufacturers, all manufacturers classifying the different types under a standard classification as issued by the Underwriters Laboratories January 1937, and listed as follows:

Type SD-Service Drop Cable, labeled by Underwriters with white label with yellow bar.

Type SE-Unarmored Service Entrance Cable, labeled by Underwriters with blue label.

Type ASE-Armored Service Entrance Cable, labeled by Underwriters with brown label.

Type USE-Service Entrance Cable, for use underground, labeled by Underwriters with green label.

Use of service entrance cables has greatly increased during the last year and has shown a considerable saving over other methods, especially in small towns and rural districts. In some states and cities the interpretation of grounding rules by the Code enforcing bodies has prohibited the broad use of service entrance cable, but it is believed that this condition will soon be changed. Committees on grounding rules for the states of Oregon and Washington have been working on grounding interpretations and standardization of service entrance equipment, and it hoped that within a short period new rulings will be issued by the state authorities.

Interior wiring assemblies of code wires enclosed within a loom sheath or braid, such as Romex, Lumflex, etc., providing an economical and safe wiring installation, have steadily increased in use, especially finding favor with contractors in the small towns and rural districts.

Type CNX cable, namely, the interior wiring assembly with covered neutral, is still in the trial stage and as yet not accepted as a wiring method by Code authorities.

Discussion

M. T. Crawford, L. W. Going, F. D. Weber and J. O'R. Coleman discussed the Type CNX cable referred to in Mr. Clark's paper. It was brought out that this type cable was used in Canada when there is a two-coil transformer

between the line and the service and when the resistance between the neutral and grounding is one ohm or less. There is now a committee doing research on grounding, and the Electrical Committee is awaiting its report before permitting CNX in the Code. Mr. Coleman stated that some cable almost identical with the present Type CNX cable was found installed in Cleveland in 1901. When discovered last year, it was giving satisfactory service.

An additional report of the Codes Committee, "National Electrical Safety Code Requirements for Overhead and Underground Construction Compared with State Laws and Regulations Now in Effect" by L. R. Gamble, The Washington Water Power Co., was read in his absence by M. T. Crawford.

Roy E. Kistler, Pacific Telephone & Telegraph Co., presented a written discussion of certain aspects of the National Electrical Safety Code as it affected clearances between power and communication circuits. This was followed by a further discussion participated in by M. T. Crawford, Paul P. Ashworth, A. Vilstrup, J. O'R. Coleman, R. J. Davidson, and Frank Walsh. Consensus was that the N.E.S.C., which is standard in all states in this territory except Washington, is preferable to the Washington rules, and that adoption of the National Code by the state of Washington would be desirable. It was brought out that a committee is now working on a revision of the N.E.S.C. as to the parts applying to overhead and underground construction. It is expected that a draft of the revision will be ready a year from now and that a revised code may be approved two years from now.

Utilization Committee†

Introductory Statement

PAUL P. ASHWORTH, Utah Power and Light Co., and chairman of the Utilization Committee, opened the session by exposing the economic fallacy of political rate making as exemplified by practices proposed for several of the large federal projects. He called attention to the request of California congressmen for reduced rates at Boulder so that California industry would not be attracted by Bonneville's cheaper power. Aside from the fact that rate fixing by politics is thoroughly repugnant, he stated that the entire argument that cheap power is an important factor in plant locations is fallacious.

Power cost has little to do with the location of industry because the cost of power is an almost infinitesimally small item of the total cost of doing business. Were cheap power the important factor that certain people intimate, the Northwest should have attracted all of the industry in the United States to its territory as its rates are far below those elsewhere.

Actually, the factors that entice business to certain localities have been thoroughly established by surveys made by the Metropolitan Life Insurance Co. and the former National Electric Light Assn.

Although not the utilization committee, these men are prominent in the Association's activities. From left to right are: "Crit" Woolsey, G. E. Supply Corp., Seattle; Skene Moody, General Electric's Northwest manager; Harry Collins, Washington Water Power Co., Spokane; Leonard Elder, General Electric Co.; Harry Schoolfield, Pacific Power and Light Co., and Ed Pearson, Northwestern Electric Co., Portland

From some 20,000 different industries, the following plant location factors were obtained, analyzed and classified in order of importance:

1. Markets
2. Transportation
3. Raw Materials
4. Labor conditions and availability of skilled labor
5. Available factory sites
6. Personal reasons
7. Power and fuel

and so on for a total of 16 different items.

Power and fuel are in seventh place and considered less important than "personal reasons", or the owner's or management's whims as to where he would like to locate. Given a good market, good transportation facilities, and availability of raw materials and skilled labor, cheap power is less important than intangible personal factors. Perhaps justly so considering these figures. Electric service is but 3 per cent to 4 per cent of the total cost of cement manufacture; it is but 4 per cent to 7 per cent of the cost of level mining processing; power to produce a barrel of flour costs 5 cents. (Packaging the barrel of flour costs 25 cents); electrically mined coal costs 13 cents per ton, approximately 1 per cent of its average selling cost; all of the uses that department stores adopt for displaying their products cost them just 1 per cent of their gross.

Since these studies were made, another factor of great importance has come into the picture; namely, the attitude of the community toward industry as regards legislation, taxation, local pride, patronage, etc. If the Northwest wishes new industries, it must be fair to present business. Business management will not invest its money in localities which have a reputation for "baiting" business.

To rout the cheap power argument in plant location still further, Mr. Ashworth challenged anyone to name a major industry that was not already operating in the Northwest before the advent of electric service. He pointed out that electric service is a tool which was adopted by industry and not the machine which created it.

The Utilization Committee should and does recognize that its primary purpose is to create new uses for old customers and also new customers to the end that better service rendered may build more income for the electrical industry. This has to be done largely with existing customers, by creative selling of electric service, and not merely by legislating a power rate and then sitting back to await the influx of industry.

† Paul P. Ashworth, Utah Power & Light Co., Chairman; Walter Brenton, Portland General Electric Co., Vice-Chairman; B. C. Electric Railway Co., E. E. Walker; The California Oregon Power Co., R. S. Daniels; Eastern Oregon Light & Power Co., B. F. Lents; General Electric Co., H. T. Plumb; The Montana Power Co., E. W. Williams; Northwestern Electric Co., S. B. Clark, Corbett McLean; Pacific Power & Light Co., D. R. McClung; Portland General Electric Co., A. H. Greisser, F. H. Murphy; Puget Sound Power & Light Co., R. E. Thatcher; The Washington Water Power Co., C. E. Cannon, Finley Kellog.

Meter Developments and Improvements*

By RENO THATCHER
Puget Sound Power & Light Co.

THE report of the Meter Committee is confined to the enumeration of what appears to be the more important developments during the year of the meter as a unit and to an account of the record of accomplishment in the search for a more satisfactory lower bearing for meters. Some of these developments are of such a character that, if they accomplish all that is now hoped for them, they will have a far reaching effect on future operating practices and policies.

Lower Meter Bearing

Throughout almost the entire history of meter development the lower bearing has been either a steel pivot operating on a cup sapphire or diamond jewel or a steel ball operating between two cupped jewels. The various trouble experienced with these bearing combinations did not appear of sufficient magnitude when compared with other characteristics of the earlier meters to cause serious concern. But with the improvement in design in other respects of modern meters the weakness of this part of the meter has become more prominent by contrast, and has been recognized as one of the chief hindrances to an extension of the time period between routine tests on the customers premises.

In the study of this subject, two divergent opinions have developed as to what is the most satisfactory operating condition to be attained. One group has sought a bearing which can be operated without lubrication for long periods of time with a very slight relative increase in bearing friction. The other has believed that proper lubrication combined with material in the bearing free from the defects found to exist in the old materials is the answer to the problem. It has been quite generally recognized that the sapphire is an acceptable material for the jewel. Since the supply of this material in the natural state is ample (it can also be manufactured synthetically), no change in this material has been made. Study and experiment have therefore been made to secure a more suitable material for the pivot in the meters of those manufacturers which use the pivot and jewel type of bearing.

During the past year announcement has been made by some of the manufacturers of the development and adoption in their meters of new pivot materials which preliminary tests indicate will greatly increase their operating life. The new product of the different manufacturers embodies the ideas of both schools of thought among meter men with regard to lubrication.

The General Electric Co. has developed a pivot of cobalt tungsten alloy. The shape of the pivot follows quite closely the shape of its steel predecessor, being interchangeable with pivots in all the older meters. While preliminary tests indicate that the new pivot will give much longer life when operated without lubrication than the steel pivot, it is recommended by the manufacturer that it be operated with lubrication. The type of jewel screw with an oil reservoir in it, used in the late I-16 and all I-20 meters with a specially compounded and refined oil developed for the exacting conditions under which meter bearings operate, is claimed by the manufacturer to furnish proper lubrication. While there is some initial wear on the curved surfaec of the pivot this wear area and consequently friction tends to become stable as is shown by the curve in Fig. 1.

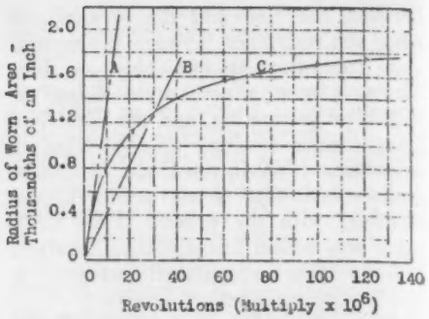


Fig. 1. Accelerated life test wear curves
A—Standard steel pivot without lubrication; 12x10⁶ revolutions for a worn area radius of 0.0015 in.
B—Cobalt-tungsten pivot without lubrication; 34x10⁶ revolutions for a worn area radius of 0.0015 in.
C—Cobalt-tungsten pivot with ideal lubrication. Pivot radius 0.0185 in.

An important quality of the new alloy pivot is that it is softer than steel, and, under the impact of the pivot on the jewel caused by a short circuit, it tends to flatten slightly, thereby reducing the stress on the jewel and preventing cracking its surface. The flattening which takes place under this condition was found in the tests to be so slight that it produced almost no measurable increase in friction.

The Duncan Electric Co. has produced a precious metal alloy pivot material which they have named "nobeloy". A small tip of this alloy is inserted in a body of stainless steel to overcome any tendency to rust, since this pivot is intended to operate without lubrication. The shape of the pivot bearing surface departs quite radically from conventional design.

Fig. 2, is a view of the standard steel pivot in a jewel of standard radius highly magnified. The left view represents a clean jewel while the one on the right represents one with an accumulation of dirt. Fig. 3, is a view of the new pivot magnified to the same scale. The left view represents a clean jewel while the one on the right represents a jewel with an accumulation of dirt. Note the conical shape of the lower portion of the pivot with contact point of the pivot and jewel having the same radius or curvature. On the right of the two views of the pivot point is a graphical representation of the relative contact areas and pressures of the new pivot in comparison with the steel pivot.

It is stated that this new material has a low coefficient of friction with sapphire, which, together with the low pressure per unit of area and a shape which tends to prevent dirt particles from getting between bearing surfaces, also reduces the cracking of jewel surfaces from short circuits and makes a bearing with extremely long life. At the present time this pivot is being supplied only in the Type MG polyphase meters.

Fig. 2

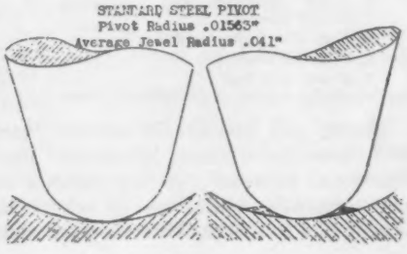
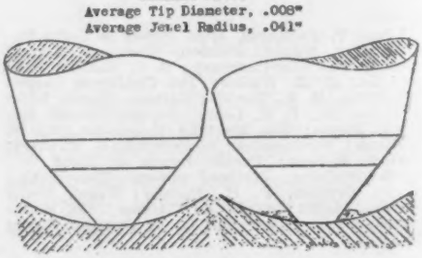


Fig. 3



* Report of metering subcommittee.

Type I—30 Meters

The General Electric Co. have announced the development of the I-30 meter. The design of this meter is such that the load curve has been extended considerably beyond the limits of any previous design on both the light load and full load ends of the curve. With this design, it is proposed to cover the full range of self-contained meters with but three sizes: a 2-wire meter which will start on 4 watts and measure with an accuracy of plus or minus one per cent a load up to 6,000 watts; a domestic meter, 3-wire, which, when adjusted at five per cent of nominal rating will measure light loads at an accuracy equal

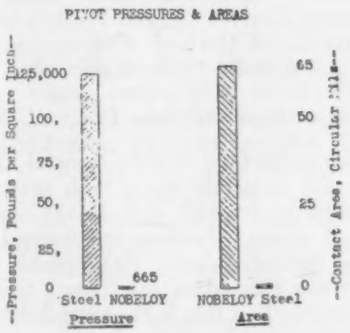


Fig. 4

to or superior to the smallest size present 3-wire meter and yet will have an accuracy within plus or minus one per cent on loads up to 60 amperes; and a commercial meter which will start at 16 watts and measure loads with an accuracy of plus or minus one per cent up to 150 amps. A meter with a nominal rating of 2.5 amp. is included in the line for use with instrument transformers. The meter is adjustable for full load, light load, and lag, and is compensated for temperature change. All of the other meter manufacturers have indicated that they have a similar development under way but detailed information is not available at the present time.

Consideration of the effect which this development will have upon operation and manufacturing costs will furnish a measure of its importance. Approximately 90 per cent of all installations calling for self-contained meters can be handled with two sizes of meters, the 2-wire meter and the domestic meter. This will reduce the manufacturers production, warehousing, and other costs. For the utilities it will reduce the investment cost by reducing the number of sizes of surplus meters to be carried in stock, will simplify the selection of the proper size meter to be installed for a given load, will reduce the number of meters to be carried by each installation crew and reduce costs in many other ways.

Through Type Current Transformers for Secondary Voltages

Several manufacturers are producing through type current transformers for use with watt-hour meters for secondary voltages with ratings as low as 200 amp. which have ratio and phase angle curves comparable with the best wound types. Contrary to previous practice, these transformers will carry considerable overload without overheating. The principal value of these transformers is in their ease of installation, the material reduction in the size of box or the space required for mounting, and their overload characteristics following more closely that of the associated watthour meter.

Polyphase Meter for Socket or Type A Mounting

Two-element polyphase meters for mounting on standard size sockets or Type A mountings are available from all manufacturers. To meet the limited space requirements, the Duncan Electric Co., General Electric Co., and Sangamo Electric Co. have developed their meter with the electro-magnet of both elements operating on one disc especially designed to prevent interaction or interference between elements. The Westinghouse Co. employs two discs. The new design is said to have operating characteristics equal to or superior to its predecessor and is priced considerably below comparable sizes, which is important.

The Westinghouse Company has developed a 3-element meter for mounting on standard sockets. A double base arrangement provides a round portion to fit the socket and an oval portion on which to mount the meter elements and oval cover.

There have been many improvements in details of meters and associated devices but time and space allotted for this report does not permit their inclusion.

Electrical Heating of Residences*

By H. V. CARPENTER
Dean, College of Mechanical Arts and Engineering, State College of Washington

Discussion

John Bankus—Dean Carpenter points out that studies of temperature records for the State of Washington indicate that an annual load factor of 35 per cent can be realized for an average six room house with a connected requirement of 12 to 15 kw., provided deficiencies in excess of 40 deg. F. below 65 deg. F. are taken care of by an auxiliary source.

I presume that the 35 per cent annual load factor mentioned is to be regarded only as a theoretical possibility when the heating requirements are evaluated for certain temperature conditions and is not intended to represent the annual load factor which may be expected from an actual auxiliary electrical heating installation.

If a 35 per cent annual load factor were applied to demands of 12 and 15 kw. it would mean yearly consumptions of 36,792 and 45,990 kw.-hr. respectively. At ½ cent per kw.-hr. this would involve yearly expenditures for energy amounting to $183.96 and $229.95.

Comparing the theoretical figure given in the paper with the data obtained from certain installations using auxiliary electric heating, I submit the following data from the City of Tacoma for the year 1935.

	No. of Installations	Connected Load
Complete heating	241	1566 kw.
Auxiliary heating	1306	7396 kw.
Combined	1547	8962 kw.
1935 kw.-hr. for complete and auxiliary heating		2,909,506
1935 kw.-hr. for average of 1547 installations		1880
1935 average hourly load per installation		.2145 kw.
1935 average connected load per installation		5.79 kw.
Average annual load factor (assuming yearly peak load per customer is equal to customer's connected load in kw.)		3.7%

I have also been informed that the annual load factor for heating in southern California does not usually exceed 5 per cent.

L. A. McArthur—The shortcomings of electrical house heating from the utility company standpoint are substantial, as Dean Carpenter has pointed out in his paper. Low temperatures do occur in Portland and sometimes prevail for a considerable duration and hence an off peak basis of heating would probably not be satisfactory. The rate for electricity equivalent to gas for heating would be about 2½ mills per kw.-hr. and you would not be offering the customer any particular advantage when you sought to replace his present heating equipment at this rate.

A. Vilstrup stated that in Switzerland soap stone has been used as the agent for heat storing instead of water or fire brick as in this country. If elec-

* Published in April, 1937, issue of *Electrical West*.

tric heating ever is applied to residences, it need not follow the usual accepted method of a central heating plant. The flexibility of electricity offers an opportunity of heating walls and floors, and so applied, might make it possible to live comfortably in air temperatures considerably lower than 70 deg.

Paul B. McKee stated that he doubted that electrical energy could be distributed in Portland at 2½ mills per kw.-hr. He indicated that he would like to see some actual tests made in representative residences in Portland, Seattle and Spokane for the purpose of determining the actual conditions in this territory.

Dean E. A. Loew stated that some studies he had carried out indicated that a 5 mill rate for electric house heating in this territory would make the heating cost from $250 to $300 per year. He felt that electric energy might be used for incidental heating on a profitable basis up to the capacity of the distribution system, but that it could not be considered economically feasible where the heating load would require complete reconstruction of the existing system.

George E. Quinan described certain studies carried out over a period of years which had led to the definite conclusion that it is not possible to sell prime power in competition with coal or oil for heating the average home. In Seattle the temperatures drop occasionally to 10 deg. and may remain low for two weeks or more, and this is far beyond the capacity of any possible heat storage scheme. Houses of 16,000 cu. ft. capacity can be heated by oil for around $100 annually, with an installation cost for equipment of around $700. To do this electrically would require 35,000 kw.-hr. per year in addition to providing auxiliary heat to take care of the excessively low temperatures. Even electric heat for normal conditions must be provided on an off peak basis, which would require heat storage in the order of a million B.t.u.'s on a 10-hour charging basis. An experimental heat storage installation of this capacity cost $5,000, which was reduced after much experimentation and redesign, using fire brick as a storage medium and uninsulated resistor wires and a greatly simplified control system, to $1,100.

The Puget Sound system could take on approximately 3,000 installations on the off peak basis, but beyond this number additional heating installations would have to be carried on prime power. Three thousand installations in Seattle would be but a drop in the bucket and it is evidently impossible to seriously consider house heating electrically on a comprehensive scale in that city.

Recent Developments in Utilization of Electric Service*

By CORBETT McLEAN
Northwestern Electric Co.

Mercury Vapor Lamps for Industrial Use

THERE are two installations of Mercury Vapor Lamps for industrial use, one of 16,400-watt units and the other of 15,400-watt units, on the Northwestern Electric Co. system. Thirty to 35 lumens of light output per watt are secured as contrasted to 18 to 20 lumens per watt from the present Mazda lamps. With proper combination of incandescent lamps, color correction may be obtained. The initial cost to the customer is high and the color distortion is great when the Mercury Vapor Lamps are used alone. Unless corrected, the power factor is low.

High Pressure Neon—Mercury Lamp

In the Feb. 8, 1937 issue of "Time" was described a new lamp developed by Cornelis Bol, at Stanford University. Neon is used to start an electric arc in a small quartz tube full of mercury. This tube is less than ¼ in. in outside diameter with inside diameter of .08 in. to .04 in. At the core of the vaporized mercury which has reached a pressure of 300 atmospheres, the temperature reaches 14,000 deg. F. Water utilized at high speed to prevent steam bubbles cools the tube.

A 5-in. lamp gives a maximum of 80,000 candlepower at 8000 volts with a current of 1.5 amp. This is equivalent to approximately 67 lumens per volt amp.

The heat given off is negligible since the light of the mercury vapor slides off the visible spectrum at the opposite side from the red where heat waves predominate. However, there is enough red light for photographic purposes.

It is believed the lamp will be useful for lighting of airports, cinema production, and treatments of diseases. Manufacturing rights have been leased to General Electric Co. and Philip's Glow Lamp Co. of Holland. Cost figures are intimated to be "ridiculously low."

Capillary Tube Lamp

We understand that the General Electric Co. is producing a high pressure capillary tube with high lumen output in all colors. Powders are inserted to give desired colors. 100 lumens per watt are secured at low power factor. It may be that this is the same lamp as described in "Time".

Light Heated Hot Frames

Since the article by M. C. Parker on Light Heated Hot Frames was presented last year, some additional data is available. The incandescent lamp was used in a frame for winter storage as well as for root and plant growth.

From Dec. 27, 1936 to Feb. 6, 1937 some valuable Chrysanthemum plants were kept in a winter storage frame. The room thermostat was temporarily replaced with an undersoil bulb type thermostat set at 40 deg. F. to prevent freezing and to inhibit plant growth. Energy consumption for the above period was but 32 kw.-hr. in spite of the fact that January with 1091 degree days was colder than normal. The effect of this method of winter storage in contrast to ordinary basement or hot house storage will not be fully known until this fall.

On Feb. 15, 1937, three light-heated frames were started with sowings of seed and at the present date remarkable growth and root development far above average have resulted. Two of the frames were constructed of hollow tile with double sash as described in the article last year, and the other was made of wood with building paper under the outer siding and a layer of newspaper under the inner siding with only

Kitchen Design— An Aid To Loadbuilding*

By WALTER BRENTON
Portland General Electric Co.

*Published in March, 1937, issue of *Electrical West*.

Contributed for the record when the scheduled round table discussion of this subject by the Utilization Committee was omitted for lack of time.

single sash. All frames were banked with sand for the purpose of keeping frost from the soil and masonry. Current consumption for the three frames totaled 14 kw.-hr. for a period of 18 days (0.78 kw.-hr. per day) or 0.0111 kw.-hr. per cu. ft. for air per day.

Inside frosted lamps, rated 100 watts, were used in reflectors similar to Benjamin No. 11075 N and all walls were painted white. A 110-volt room thermostat set at 58 deg. F. with a variation of plus or minus 1 deg. was used in each frame.

Data obtained compare very closely with that of John M. Arthur and C. L. Porter as reported in the April-June 1935 "Contributions from Boyce Thompson Institute for Plant Research". In this experiment, 2024 kw.-hr. were used during a period of 115 days to heat 1386 cu. ft. of space at an average consumption of 0.01269 kw.-hr. per cu. ft. per day.

Accident Prevention Committee†

Causes of Accidents Among Commercial Fleet Operators

By R. S. MAXWELL
Chief Safety Inspector
Puget Sound Power & Light Co.

A REVIEW of the fatalities in industry during 1936 reveals that the traffic accident ranks second in classification of these fatalities. The loss of human life and consequent suffering was appalling. Over 38,000 deaths were directly chargeable to the inability to control the use of automotive vehicles, an average of one fatality every fifteen minutes.

Using the ratio common to industrial accident prevention work, each death means 29 personal injuries. At that rate a human being is being injured by automobiles every twenty seconds throughout the year.

This is a matter of grave concern and general improvement cannot be expected unless the several phases of the modern traffic situation are examined thoroughly.

The automobile is not inherently dangerous nor have its builders been remiss in providing reasonably safe designs. Quite the contrary. That the death rate from automobile accidents is not greater is largely due to the safety, reliability and flexibility of control which have been built into the modern automobile.

Public service companies have a direct, as well as humanitarian interest, in the traffic problem. The good will of the public, which the industry has come to recognize as a basic necessity to its existence, depends upon courteous and considerate driving of company vehicles.

The methods used by the different member companies (which will be mentioned later in this article) may not be applicable to any individual company but the basic principles are the same. First, the management must take very seriously the idea of prevention of company vehicle accidents. Second, the individual driver must give his full cooperation to the plan.

Industrial accident prevention programs recognize the ratio of 1 to 29 to 300 in determining the causes of accidents. Applying this same ratio to vehicular accidents, if investigation of each individual accident will determine the cause, a forward step has been taken in preventing accidents in the future because, by knowing the causes, ways can be found to eliminate them.

Taking the statistical records of the United States the causes of motor vehicle accidents have been boiled down to the following:

Careless Backing
Driving too Fast for Conditions
Following too Closely
Failure to Give Right-of-way
Inattention
Cutting in and out
Loss of Control
Improper Loading
Passing Traffic Signal
Improper Turning
Passing on Curve
Passing moving Vehicle too Closely
Reckless Driving
Driving on Wrong Side of Street
Passing Standing Vehicle
Defective Equipment
Pedestrian
Driving While Intoxicated.

Members of this organization have been circularized with this list of causes. Reports received from most all of the inquiries sent out show that the number of causes given for each accident ranges numerically as listed above.

It is useless to attempt to establish set rules governing the above causes. Each individual company must treat these causes in a way that is most applicable to its own particular situation. Going further into the prevention of automobile accidents, numerous plans have been placed in effect in the different companies. These are detailed below.

COMPANY No. 1:—This company has no plan other than publishing each month a report giving the number of automobile accidents and the estimated amount of damage to company equipment from every district. It does not give prizes because it is felt that the prevention of accidents is a question of management, the philosophy being that results are better obtained by having the supervisory force teach safety to the employees under it.

COMPANY No. 2:—This company reports that it has carried on contests between departments since 1930 and believes that it is an excellent means of instilling and holding interest in the prevention of automobile accidents. It reports that the number of accidents has steadily decreased in spite of the fact that mileage has increased.

COMPANY No. 3:—This company conducts interdepartment contests. At the beginning of the year each department is allowed 100 points for each 10,000 miles of travel. The penalties for having accidents are represented by deduction of a certain number of points from those allotted.

COMPANY No. 4:—This company reports that their only activity along accident prevention lines consists of reporting all accidents to the insurance company and the insurance company conducts the investigations. Its record is very poor.

COMPANY No. 5:—This company reports that their automobile accident prevention campaign is handled through their supervisor of safety, who, in turn, holds each department head responsible for all automobile accidents involving employees under his supervision. Formal investigation of every automobile accident is held to determine the responsibility and cause of the accident. Findings of such investigations are printed in bulletin form and posted on all bulletin boards of the company. The investigation committee consists of the supervisor of safety, department head, foreman, and the employee involved.

COMPANY No. 6:—This company reports an investigation of all automobile accidents by an investigating committee composed of two men doing similar work to the employee involved, and the employee's supervisor. The safety engineer conducts the investigation. Its plan is to bring out the cause of the accident, responsibility, and ways and means of eliminating similar accidents. There is no penalty assessed.

COMPANY No. 7:—This company awards merit badges to all drivers who have driven for a period of one year without an accident. This is determined by its insurance carriers who do not consider an accident unless damage is paid to the other party.

COMPANY No. 8:—This company does not hold investigations of automobile accidents, but, in the different departments, a safety committee of three is used to serve for a period of one month. It is

Joe Henkle, Portland General Electric Co. (left), and J. D. Ellis, Northwestern Electric Co. (right), brought Charlie Cutter, Pacific Electric Mfg.'s star salesman, down to get his picture taken. Ask Charlie why he stands in the middle

†J. D. Ellis, Northwestern Electric Co., Chairman; B. C. Electric Railway Co., A. Vilstrup; The California Oregon Power Co., S. M. Bullis; Eastern Oregon Light & Power Co., B. F. Lents; Grays Harbor Railway & Light Co., W. C. Kidder; Idaho Power Co., R. D. Jefferson; Mountain States Power Co., Walter Smith; Pacific Power & Light Co., George I. Drennan; Portland General Electric Co., E. D. Searing; Puget Sound Power & Light Co., H. G. Winsor; Utah Power & Light Co., W. L. Cone; The Washington Water Power Co., J. B. Fisken.

the duty of this safety committee to observe the driving of employees. When an infraction of the company rules or traffic laws is observed, the violator is approached by the members of the safety committee and is advised of the violation. An employee who thus offends three times in one month is reported to his supervisor and the supervisor may take such steps as he deems advisable in regard to the penalty.

COMPANY No. 9:—This company investigates all automobile accidents through an investigating committee which is composed of a safety committee in each department. If, upon investigation, an employee has had three accidents in which he was at fault within one year, the man is given other work which will not require the driving of a car.

COMPANY No. 10:—This company investigates all accidents. These investigations are made by the department head who assesses the penalty in accordance with his estimation of the severity of the accident. For example: One driver had three backing accidents. The penalty was that every time he started his truck he had to walk around the truck. This penalty was in force for three months.

COMPANY No. 11:—This company conducts an investigation of all automobile accidents and publishes a monthly report of the findings. This company also conducts contests between departments for short periods of time. It believes that interdepartment contests can be overdone so that contests are for a period of one month, three times a year.

COMPANY No. 12:—This company reports group meetings of all drivers once each month. At each meeting a discussion is held on all the accidents happening during the previous month. Posters from their insurance company are used in an attempt to keep safe driving before the employees at all times.

There are other methods in force, but time and space will not permit expansion of the details of these plans. From the reports of member companies it is evident that the old rule holds, that there is a cause for every occurrence. These causes happen in the same ratio that is used in other accident prevention work, so that, in the elimination of motor vehicle accidents, the thing of vital importance is the classification of causes.

Discussion

Paul P. Ashworth—Recent experience on a jury has indicated to me that from a legal standpoint both parties to a traffic accident must exercise reasonable care. If one was in the right according to law and yet did not exercise reasonable care, which might have avoided the accident, he will not be exonerated.

Walter Smith brought out the fact that Rotary Clubs and other civic organizations are interesting themselves in the prevention of traffic accidents and that our companies should cooperate in this movement.

J. D. Ellis—The paper by Mr. Maxwell gives a very comprehensive list of causes listed by Mr. Maxwell so that interesting to gather an experience record of traffic accidents against the causse listed by Mr. Maxwell so that emphasis could be directed against the predominant causes in an attempt to cut these accidents down.

S. M. Bullis—Mr. Ellis' suggestion is a good one except that a company could not publish causes or a discussion of such accidents until after the insurance claims were settled.

George I. Drennan — Old broken down cars are a major cause of traffic accidents. We need an inspection law for cars that will remove these old menaces from the highway. Many civic organizations are taking up the prevention of traffic accidents. In Walla Walla the Lions Club is active. Safety lanes for schools with student patrols have been effective. Stop lights on arterial highways and similar mechanical controls have helped.

It is essential to encourage employes to keep their minds on the work they are doing. Accidents do not always happen to new inexperienced employes. Many of our serious line accidents have occurred with experienced men who have been doing this kind of work for years. I would like to see the companies offer rewards for favorable accident records rather than exact penalties for unfavorable records.

1936 Personal Accident Experience of Member Companies*

By J. D. ELLIS
Northwestern Electric Co.

TWELVE member companies reported on their personal accident experience for 1936. This report includes only accidents involving personal injuries which caused lost time other than time lost on the day of the accident.

National Safety Council scale of time charges was used for deaths and either partial or permanent disability. The time charged for temporary disability was the actual number of the employee's regular working days missed including the carry-over time lost in the following year.

The total number of man-hours of exposure was taken from the payroll records when available; if not, it was estimated from the average number of employees and average hours worked per week.

National Safety Council standard rules for computing accident frequency and severity rates were used as follows:

$$\text{Frequency Rate} = \frac{\text{Number of disabling injuries} \times 1{,}000{,}000}{\text{Number of man-hours of exposure}}$$

$$\text{Severity Rate} = \frac{\text{Total days lost} \times 1{,}000}{\text{Number of man-hours of exposure}}$$

The accident data received were tabulated in four different classifications, namely; occupational, cause, type of accident, and nature of injury.

Comparing 1936 personal accidents with those of 1935, we find an increase of 82 lost time accidents which amounted to a 32 per cent increase. There was also an increase in the man hours worked of 2,645,720 which was 14 per cent greater than the 1935 exposure. The frequency rate for the year 1936 increased 15.7 per cent over that of 1935 and 70 per cent over that of 1933 which was our best year from the standpoint of accident prevention since we started making this report in 1929. These figures show quite definitely that the accident prevention work of member companies as a whole is not as effective as it should be and is not keeping pace with their increased business. Whenever there is an increase in company operations or construction, there should be a proportionate increase in the efforts devoted to accident prevention to avoid an increase in accident rates.

In analyzing the accidents as to cause, we attributed 51 accidents, or 15 per cent with 1,116 days lost, to supervisory responsibility. The prevailing causes, in the order of the greatest time lost, are as follows: The use of unskilled labor, inadequately instructed; the use of defective tools and equipment; attempting to expedite work by disregarding safe practices; hazardous working conditions and methods. Under employees' responsibility fell 267 accidents or 79 per cent, with a total of 42,442 days lost. In this classification, fell all 7 fatalities. The major causes in this group in the order of the greatest time lost are—carelessness, disobedience of rules and instructions, and poor judgment. In the unavoidable group were charged 20 accidents or 6 per cent, with 6,442 days lost. No doubt, some of these could have been attributed to some definite cause had more complete information regarding these accidents been reported.

Under the Occupational Classification, the generation and transformation group accounted for 118 accidents or 35 per cent, with 7,561 days lost. The skilled workers had the greatest lost time, except for one fatality in the unskilled workers class. The transmission and distribution group contributed 194 accidents or 57.3 per cent with 42,052 days lost which is 84 per cent of the total time lost in 1936. This great loss of time is due largely to the fact that

* Summary of Report of Accident Prevention Committee, Engineering and Operation Section.

there were 5 fatal accidents to linemen and one to a supervisor, and partially to a large number of non-fatal accidents to both linemen and groundmen, working on construction and maintenance. The general group accounted for 26 accidents or 7.7 per cent with 387 days lost. Shop and storeroom employees and field engineers lost 290 days while office workers lost 97 days.

The Type of Accident Classification shows that contact with an electric circuit is still the most serious accident, causing 6 fatal accidents in 1936. The other fatality was due to a fall from a pole. The types of accidents in the order of greatest frequency are; falls of all kinds, handling materials, use of hand tools, and falling objects.

The most serious accidents in 1936, according to the nature of the injury, were electric shock, with 30,071 days lost which includes 5 fatalities; burns with 9,681 days lost including 1 fatality from electric burns; concussions with 6,115 days lost including 1 fatal accident; and fractures with 1,573 days lost.

I wish to compliment the four companies who reported a frequency less than 8, and, although the national average for electric utilities is not yet available for 1936, I am sure the national average will be higher. Two other companies made good records which I believe will be a little above the national average. The other companies whose accident rates are higher than the average of our section, as well as much above the national average, surely should double their efforts in accident prevention.

In 1935 our section had a frequency rate 41.5 per cent above the national average and it appears that our rate for 1936 will be just as bad. The trend of the accident curve of our Northwest Section since 1933 has been steadily upward, and it is time that we started this curve on the down grade.

Discussion

J. B. Fisken—The report of accident experience for 1936 clearly indicates that when there is a pick up in activity, as there has been among our member companies, there are more accidents. This is chiefly due to the taking on of new men for construction work and operation and not giving them sufficient instruction in accident prevention.

Our companies are trying to increase revenue and decrease expenses, but perhaps they are not giving due regard to the possibility of decreasing expenses through accident prevention. The cost of accidents to the company is high and we should not overlook the hidden costs that do not readily appear in the reports. We should pay more attention to minor accidents not causing lost time, since the investigation of these will prove of value in accident prevention work in the future. There is sometimes a hair-line margin between an accident in which no lost time is recorded and a very serious accident.

Status of Electric Farm Fences in Oregon

By R. J. DAVIDSON
Pacific Power & Light Co.

A CONFERENCE was called in Portland, September 30, 1936, for the purpose of discussion on the safety features in connection with electric farm fences.

The Oregon laws provide that no electrical device can be sold, offered for sale or given away unless it is approved either by the Underwriters Laboratories or by some other competent organization, or by the Commissioner of Labor. The first electric fence in the state came to the attention of the Bureau of Labor about a year ago, following an article appearing in one of the papers describing the use of such a device. Subsequently many farmers endeavored to construct electric fences and hazardous conditions resulted.

Snapped between sessions, this group of engineers includes (from left to right) O. W. Hurd, Northwestern Electric Co.; W. A. Laidigh, Jr., Portland General Electric Co.; A. O. Mangold and Ray Kistler, Northwestern Electric Co., and J. D. Hertz, Pacific Power & Light Co.

Some of these fences consisted merely of a lamp in series between the fence and the supply circuit. Some of the controllers offered on the market by manufacturers were unsafe and were susceptible to tampering. The Bureau of Labor then set up certain definite standards for fence controllers. The number of different manufacturers now in the market and the great variation between the characteristics of the different controllers made it advisable to review the subject and devise specifications which will prevent hazard to life from these installations.

The various manufacturers' representatives were asked in turn to describe their control equipment, followed by discussion on the various features of the controllers and their operation. Dr. Arthur Jones was then asked to discuss the effect of electric shock on the human body. His remarks were followed by a number of questions and a discussion on this subject.

State Attorney-General Van Winkle was requested to discuss the legal phase of the matter under consideration. He stated that it was illegal to sell or give away any electrical device in the state unless it was certified as approved by the Bureau of Labor; also that it was illegal for any individual or corporation to furnish electric service to any device including electric farm fences unless the device had attached a label furnished by the Bureau of Labor indicating that the installation had been made in accordance with the State Electrical Code and approved by the Bureau of Labor. Following further discussion and questions by members of the State Electrical Bureau, the meeting was adjourned.

Under date of December 10, 1936, the Oregon State Bureau of Labor issued the following Specifications for Electric Fence Controllers.

Fence Controller Specifications

1. Maximum open circuit voltage not to exceed 500 volts.
2. Current measured at the terminals of the device not to exceed 45 milliamperes. Current to be limited by some device other than a lamp and not readily tamperable. This device to provide definite separation between the primary circuit and the fence.
3. Transformers used in connection with these devices shall be so constructed that the primary and secondary coils are mounted separately on the core. Core to be grounded.
4. Circuit to be interrupted so that the fence current will be intermittent. The device used to interrupt the circuit to be so designed that it will be impossible to stop in the "on" position.
5. Shock period not to exceed one-tenth of a second. It is further recommended that the shocks occur at irregular intervals so that they will not fall in step with the heartbeat.
6. Entire assembly to be made from approved parts and housed in a dustproof case. Underwriters' Laboratories standards to be followed as far as they apply.
7. Where pilot lamps are used they shall be housed within the case and covered with a standard bull's-eye.
8. The operating mechanism, current limiting and circuit interrupting devices shall be within a sealed case.
9. These standards supersede all those previously issued, and shall be subject to change if field experience proves the existence of hazards unknown at this time.
10. Direct current controllers operated from batteries or tube rectifiers shall also comply with these specifications.

Eye Examinations for Industrial Workers*

By DR. RICHARD F. BERG
Portland Electric Power Co.

DR. BERG described the Keystone Visual Safety test made with the aid of the Ophthalmic Telebinocular manufactured by the Keystone View Co., Meadville, Pa. This instrument and the nine prescribed tests made with it were designed for testing the vision of workers in industry with a view to seeing that those workers employed in the more hazardous occupations had ocular equipment suitable for the tasks that would be demanded. The tests are directed primarily toward determining binocular vision and indicate how well the two eyes coordinate.

An outline of the nine tests:

1. Shows if the patient is blind in one eye.
2. Visual acuity — indicates his binocular vision and the vision of each eye separately.
3. Stereopsis level—a test for distance or depth.
4. Vertical imbalance—to indicate the patient's vertical vision—whether both eyes see on the same level.
5. Far point fusion—indicating how the eyes fuse at the object to be observed.
6. Lateral imbalance at (a) far and (b) near point—to show how the eyes toe-in on the object and to indicate their focusing ability.
7. Near point fusion—to determine the coordination of the eyes for close work.
8. A test for ametropia or astigmatism.
9. A test for color blindness.

There is then a value placed on these tests and if a patient does not pass 80 per cent he is considered not fit for working with machinery or for the more hazardous occupations. Frequently the patient's defect can be corrected so that he will be able to pass 80 per cent or better.

The use of this instrument and these tests frequently is the means of keeping men out of lines of work in which they are a potential accident creator, and placing them in lines of work where they can work safely.

* An abstract of an extemporaneous discussion of the Keystone Visual Safety test, for the program of the Accident Prevention Committee, Engineering and Operation Section.

Transmission and Distribution Committee†

Recent Developments in Transmission and Distribution Apparatus*

By JOHN BANKUS
Portland General Electric Company

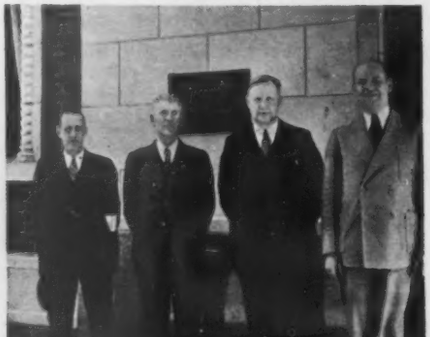
IN A single paper, it is possible to deal with only a few of the many developments which have been made recently in the above fields. However, it is hoped that the paper does cover some of the representative developments and that it may serve as a basis for discussion.

For the data which are contained in this report, the author is indebted to the various members of the transmission and distribution committee of the N.W.E.L. & P.A., to the representatives of the electrical apparatus manufacturers, and to the various articles which have appeared in the technical press. The writer wishes to express his special appreciation to Mr. H. L. Melvin of the Ebasco Service, Inc., for his contribution covering "Phase Angle Tie Line Control"; to Mr. C. E. Cannon of The Washington Water Power Co. for his description of the 110-kv. reclosing oil circuit breaker installation at Lind, Wash.; to Mr. A. C. Schwager of the Pacific Electric Manufacturing Corp. for submitting test data on high speed reclosing oil circuit breaker equipment; and to Mr. R. J. Davidson of the Pacific Power and Light Co. for operating data on step type feeder regulators.

High Voltage Direct Current Transmission

The continued interest in the field of high-voltage, direct current transmission is shown by the installation of a 30-kv. line from a point near Troy to Schenectady, New York. This line is approximately 25 miles long and operates at 15 kv. above and 15 kv. below ground potential. The line ties an old 40-cycle hydro generating plant to the 60-cycle system of the New York Power and Light Company. The terminal apparatus has a capacity of 5,000 kw. At the supply end the terminal equipment consists of a monocyclic network made up of reactors and capacitor units for changing constant potential a.c. to constant current a.c. and a 3-phase full wave Phanatron rectifier for converting constant current a.c. to constant current d.c. for transmission. The receiving terminal equipment consists of a 3-phase full wave Thyratron inverter for converting constant current d.c. to constant current a.c. and a monocyclic network for changing constant current a.c. to constant potential a.c. Operation to date has been reported satisfactory.

Left to right—"Verne" Wilfley, Westinghouse El. & Mfg. Co.; D. A. Hord, Northwestern Electric Co.; John Bankus, Portland General Electric Co., and C. T. Hurd, Allis-Chalmers Co., Seattle



220-Kv. Single Conductor Underground Cable

The 19 km. of 220-kv. single-conductor, oil-filled cable which has been operating in Paris since March 23, 1936, has established a new operating record for underground transmission of power. This cable has a normal rating of 160,000 kva. and constitutes the first step in a 220-kv. ring around the metropolitan area of the city of Paris. The detailed specifications for the cable, together with a description of the joints, terminals and method of installation, are covered in the March 13, 1937, issue of the *Electrical World*.

High Speed Breakers and Relays

During the last few years, a great deal of attention has been given to the

† E. F. Pearson, Northwestern Electric Co., Chairman; A. Vilstrup, B. C. Electric Railway Co., Vice-Chairman; B. C. Electric Railway Co., P. C. Gill; The California Oregon Power Co., R. S. Daniels; Eastern Oregon Light & Power Co., O. D. Lanning; Graybar Electric Co., E. J. DesCamp; Grays Harbor Railway & Light Co., F. J. Robbins; Idaho Power Co., C. O. Crane; The Montana Power Co., Mr. Thane; Mountain States Power Co., G. McLellan, Walter Smith; Northwestern Electric Co., A. O. Mangold; Oregon State College, F. O. McMillan; Pacific Power & Light Co., R. J. Davidson; Portland General Electric Co., H. R. Wakeman; Puget Sound Power & Light Co., C. H. Hoge, E. R. Nigh; Utah Power & Light Co., D. L. Brundage, G. W. Westcott; The Washington Water Power Co., Earl Baughn, L. R. Gamble; West Coast Power Co., C. P. Eliot.

problem of speeding up the operation of oil circuit breakers and relay equipment on important transmission lines. The benefits to be derived from the installation of high speed breakers and relays have been demonstrated by the data obtained from transient stability studies and from the improvement in operating performance, where systems operating near the stability limit reduced the fault clearing time. The reason for this improvement is evident from the formulas applicable to the step-by-step stability studies. The following formulas which are applicable to such studies, show the relations existing between electrical and mechanical quantities during fault conditions.

If E_{mws} = Stored kinetic energy in rotors in terms of electrical quantities; i.e., stored kinetic energy in megawatt-seconds.

Then $E_{mws} = \frac{2.3\ WR^2\ (RPM)^2}{10^{10}}$

Where WR^2 = Moment of inertia in lb. ft. squared

RPM = Revolutions per minute.

And if φ = Acceleration in degrees per second per second

Then $\varphi = \frac{180\ f\ \Delta\ P_{mw}}{E_{mws}}$

Where f = Frequency in cycles per second.

ΔP_{mw} = Instantaneous power in megawatts available for acceleration or deceleration; i.e., the difference between the power input and output during the interval considered.

Further, if C = Acceleration constant; i.e., the number of degrees per second per second of acceleration which will be obtained per unit of accelerating force.

Then $C = \frac{180\ f}{E_{mws}}$

And $\varphi = C\ \Delta\ P_{mw}$

NOTE: The above relations may be expressed in other equivalent forms. The formulas given above are in the form used by Mr. W. W. Parker of The Westinghouse Electric and Mfg. Co.

When a fault occurs on a system, the generators near the point of fault drop load and the difference in power ΔP_{mw} before and after the fault is the power available for changing the angular position of the rotors. The magnitude of ΔP_{mw} is most readily determined by setting up the system on an a.c. calculating table. ΔP_{mw} may then be calculated from readings of voltage in phase current taken before and after the fault. These readings are usually taken to show the relations at 0.1-second intervals.

Transient stability is usually measured by the angle through which the rotors swing from their normal synchronous positions. The angular shift for each 0.1-second step may readily be calculated when the numerical value of the acceleration φ is known. The value of φ may be calculated from the calculating table readings and the system constants by means of the formulas given above. Since the total change in angle is equal to the algebraic sum of the changes in angle which take place in each successive step, it is at once apparent why it is so desirable to clear the fault as soon as possible.

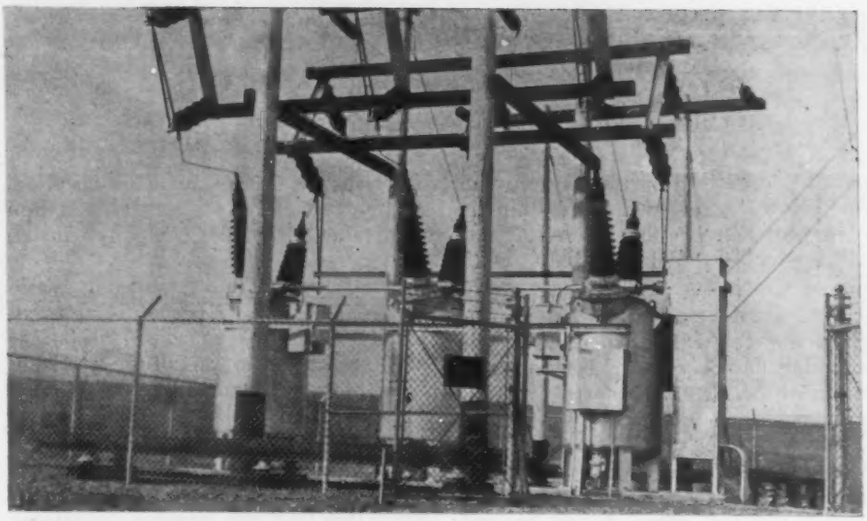
For a number of years, manufacturers have furnished 8-cycle breakers as standard equipment. Recently special 3-cycle high capacity breakers have been constructed using both the impulse and the De-ion grid principles.

The relaying has been speeded up by using relays of the impedance, reactance and the carrier current types.

Ultra High Speed Reclosing of High Voltage Transmission Lines

In order to improve the service reliability which may be obtained from single circuit transmission lines, and in order to prevent systems connected by a single tie from falling out of step when a fault occurs on the interconnecting tie, a great deal of attention has been given to the development of ultra high speed reclosing of high voltage transmission lines.

A paper by Philip Sporn and D. C. Prince in the January, 1937, issue of *Electrical Engineering* describes the problems involved in the development of such apparatus and gives the results obtained from some 300 laboratory tests, 35 reclosure field tests, and 4 lightning flashovers.



Automatic, pre-wound, spring-reclosing Type MK-3 mechanism on the P.E.M. 115-kv., 600-amp., reclosing breaker at Lind. Improved reliability has been proven by the use of reclosing breakers.

The following description taken from the above mentioned paper covers the results of four of the field tests involving phase to ground faults. "The carrier current relays operated within from .70 to 1.00 cycle after the inception of the fault to energize the trip circuits of the circuit breakers. The line was completely de-energized from 5.3 to 7.2 cycles later and remained so for a period from 10.7 to 12.0 cycles being re-energized. The total time from the initiation of the fault until the reclosing of the last breaker was from 21.0 to 21.8 cycles. On all of these tests the line was re-energized without restriking of the arc."

Mr. Sporn and Mr. Prince found that phase-to-phase faults were much more bothersome than phase to ground faults and were more apt to cause arc restriking when the line was re-energized.

The paper by Sporn and Prince also describes the performance obtained with a single circuit 132-kv. tie line between two systems (not otherwise connected in parallel) where the distance between generating stations is approximately 340 miles. "With load transfers up to 28,000 kw. over the tie line, the breakers and relays performed satisfactorily to hold the two systems in synchronism upon reclosure. With load transfers up to 40,000 kw. over the tie line, the breakers reclosed satisfactorily at both terminals of the line but the operations of the relays retripped the breakers." The paper states further that one test involving a single-phase to ground fault, with the systems

Test No.	Amps. (r.m.s.)	Voltage Across Breaker, kv.	Time to Clear Trip Coil Energized to Arc Inter.	De-Energ. Period	Reclosing Time Cycles
1	400	12.3	5.3	6.0	11.3
2	920	....	5.3	6.0	11.3
3	1800	....	5.1	5.7	10.8
4	2600	....	5.0	6.5	11.5
5	3760	....	5.5	4.7	10.2

out of parallel during the time that the line was open, recorded an angular displacement between the two systems of 41 degrees at the instant that the tie line was reclosed.

The above mentioned paper also gives the following experiences with lightning flashovers: "Since the installation of the ultra high speed reclosing equipments on the Fort Wayne-Deer Creek line in May, 1936, there have been four lightning flashovers on this line. In all cases, the flashover occurred between phase 3 and ground. The average time that the line was de-energized was 13.0 cycles. In three cases the breakers at both ends of the line tripped and reclosed within a total time of 22.0 cycles without the arc restriking. In one case, the breakers failed to stay in after reclosing because the arc restruck, which is believed to have been caused by a multiple lightning stroke."

The writer is indebted to Mr. A. C. Schwager, vice-president in charge of engineering of the Pacific Electric Mfg. Corp., for the following test data on an extremely fast reclosing mechanism connected to a single-phase of a 15-kv. expulsion type oil circuit breaker.

Messrs. R. E. Pierce, R. E. Powers, E. C. Stewart and G. E. Heberlein, in their joint paper in the October, 1936, issue of *Electrical Engineering*, have pointed out some of the additional complications to fast reclosure where an important industrial customer taps the line. The additional complication is due to the difficulty in quickly extinguishing the arc since synchronous and and induction motors in the customer's plant may provide the necessary energy to maintain the arc.

Mr. C. T. Cannon, engineer for The Washington Water Power Co., submits the following data on the 110-kv. reclosing oil circuit breaker, installation at Lind, Washington:

"The Lind switching station of The Washington Water Power Co. is located at Lind, Wash., approximately one-half mile from the Pacific Power and Light Co.'s substation. The following 110-kv. lines terminate at this switching station:

Intermountain Line to Long Lake
Intermountain Line to Taunton
Castleton Line to Moscow, Idaho
Tap to Pacific Power and Light Company's substation.

This station is unattended except for a patrol man who lives nearby and in whose house alarm signals are installed. Station service for the switching station is obtained from the company's distribution system in Lind.

The Castleton line from Lind, Washington, to Moscow, Idaho, is approximately 95 miles long. Two substations are tapped on to this line: Pullman Substation, approximately 9 miles from Moscow; and Colfax Substation, approximately 27 miles from Moscow.

"A reclosing oil circuit breaker was installed at Lind on the Castleton line when this line was changed to 110-kv. operation. The oil circuit breaker is designated by the Pacific Electric Mfg. Corp. as RWE-54, 600 amps., 115-kv., 500,000-kva. interrupting capacity and is equipped with a MK-3 pre-wound, spring-reclosing mechanism. This type of mechanism stores the energy for operating the oil circuit breaker in a torsion spring and permits one automatic reclosure of the breaker, even though the source of power for winding the spring has failed.

The reclosing relay is a General Electric Type AC-1 and at present is set for two reclosures at three seconds and thirty seconds, respectively. A voltage relay energized by bushing potential devices prevents reclosing of the oil circuit breaker if voltage is indicated on the line side of the breaker.

This oil circuit breaker was put in operation on November 1, 1936, and to date it has operated four times. On three of these occasions, the oil circuit breaker was locked out after its schedule of reclosures. These outages were due to line damage caused by wind and frost. The fourth operation was caused by flashover of a horn gap switch when it was opened. On this occasion the oil circuit breaker restored service on the first reclosure after three seconds delay.

Eventually it is planned to shorten the time delay for the first reclosure to one second or less. This should result in minimum interruptions to service, particularly from flashover of the line due to lightning.

Automatic Oscillographs

Operating engineers have long appreciated the desirability of obtaining permanent records of currents and voltages during the period of fault. With the introduction of high speed breakers and relay systems, this matter has become more imperative. Unless actual records can be obtained while the system disturbances are taking place, it becomes necessary to substitute guesswork for real information.

It has only been within the last few years that entirely satisfactory and relatively inexpensive equipment has been available for this purpose. Standard oscillographs are now available equipped with six galvanometer elements for measuring current and potential.

The oscillograph is operated from a battery and is therefore entirely independent of system conditions. The operation may be initiated by current obtained from the neutral connection of a generator or transformer bank or the operation may be initiated by undervoltage or overvoltage. Operation is therefore assured during all types of faults.

Mr. G. W. Gerell of the Union Electric Light and Power Co. of St. Louis, Mo., who has had considerable experience with this type of apparatus, reports as follows:

"Automatic recording devices are essential to a proper understanding of the performance of a high speed relay system. It has been demonstrated that they will determine:

(a) Type of fault and phases involved.
(b) Location of fault.
(c) Fault of isolation time.
(d) Magnitude of current and voltage.
(e) Sequence of relay and switch operations.
(f) Causes of incorrect relay operation.
(g) Empirical formulas to determine switching speeds necessary to preserve stability."

Carrier current is finding a very wide field of application in the design and operation of power systems. These applications include relaying, supervisory control, and communication. These applications can be only very briefly touched upon in this paper.

Carrier Current Relaying

Carrier current equipment has been developed and used for the relaying of important lines because of the advantages which it is believed to possess from the standpoint of selectivity, speed, reliability and simplicity. One of the important characteristics of carrier current relaying is that it may be applied to individual line sections without affecting or being affected by the relaying of the remainder of the power system.

Carrier current relaying does not involve accurate measurements involving current, voltage and time. The power sources for the carrier is the station battery which is independent of the transmission line. The carrier current equip-

ment plays no part in clearing a short circuit. It is used only to prevent tripping when the fault is external to the protected circuit. Since the carrier is transmitted only over a power line section carrying through power, a sound path is always insured for the carrier. While carrier current relaying is comparatively new, recent information shows that 89 terminals of this type of equipment now protect more than 1,700 miles of transmission lines.

The confidence which manufacturers and operators have in the reliability of carrier current equipment is shown by the fact that it has been applied to the important 132-kv. tie lines which connect the Niagara Hudson network with the New York Edison Co.; also by the fact that it has been applied to the 287-kv. Boulder Dam transmission lines.

The American Gas and Electric Co., referring to its own installations, gives the following operating experience. "Experience on these relay installations indicates that carrier relaying is reliable and effective. During this 18-month period about 50 internal faults were cleared satisfactorily by the carrier relays and approximately 150 external faults occurred, during which the lines were held intact. Of the 50 internal faults, four were simultaneous trouble on both circuits of a double circuit tower line, and in each instance breakers at all terminals cleared simultaneously in less than 20 cycles. One of these four involved a double circuit section with a tap off station and all six breakers cleared simultaneously from the carrier current relays."

Supervisory Control by Carrier

The Boulder Dam-Los Angeles transmission line offers an outstanding example of the possibilities of supervisory control by carrier. The Boulder Dam transmission line has one terminal at the Century Receiving station in Los Angeles and includes two intermediate switching stations spaced approximately 90 miles apart.

The two intermediate switching stations are controlled by carrier from Boulder Dam. Indications of all operations are transmitted to the dispatchers at both Boulder Dam and Los Angeles. Reports state that the system has been designed so that switching operations may be carried out under such adverse conditions as would exist during short circuit, grounds or broken conductors.

Communication by Carrier

Communication by carrier transmitted over power lines has been common practice for many years. However, in connection with the Boulder Dam transmission line, it has probably been utilized to a higher degree than in any of the preceding installations. Published reports give the following account of the flexibility of the Boulder Dam-Los Angeles line communication system. "Any station in the system—the Boulder Dam and Los Angeles dispatching stations, Silver Lake, Victorville, and Century switching stations—can talk to any of the others individually, or all of them at once, conference fashion. Also, the patrol cars will be equipped with carrier telephone receivers and can hear instructions sent them if they are on the patrol road, which is within a mile of the transmission line at all points."

The control of power and energy interchange between systems and the holding of interconnecting line loadings within stable or desired limits is being accomplished with reasonable success by The Montana Power Co. and The Washington Water Power Co. through the automatic control of the phase angle displacemnet between the two systems.* The equipment consists of:

(1) A Westinghouse carrier current transmitter located at the East Side 110-kv. Substation near Spokane; frequency range 50 to 150 kilocycles (now operating at 62.5 kc.), power input 130 volts, 60 cycles, 1200 watts, modulated high frequency output 150 watts.

Two sets of coupling capacitors, each consisting of three 25-kv., .005 microfarad units (.0016 mfd total) connected to two of the 110-kv. conductors with protective and switching equipment in the leads to the transmitter. The carrier frequency is modulated with 60-cycle voltage from the secondary of a 110-kv. potential transformer connected to the East Side Substation bus.

(2) A Westinghouse carrier current receiver located at the Morony 45,000-kw. hydroelectric station near Great Falls about 400 miles from Spokane; frequency range 50 to 150 kilocycles (now operating at 62.5 kc.), power input 115 volts, 60 cycles, 85 watts, audio output 1 watt.

Two sets of coupling capacitors, similar to those at the East Side Substation.

(3) A Leeds & Northrup phase angle anl frequency control equipment combined with a Westinghouse phase shifter located at the switchboard of the Morony plant.

The component parts of the equipment are (a) phase shifter; (b) phase angle recorder; (c) phase angle indicator; (d) phase angle controller; (e) frequency controller; (f) impulse integrator.

In operation, the voltage at the Morony plant is compared with the voltage received from the East Side Substation (Spokane) in time position or angular displacement by means of the phase shifter and phase angle recorder and indicator, then the angle is controlled to desired adjustable settings through the automatic control of the kilowatt output of the Morony plant. Four types of control can be secured as indicated hereafter:

(1) *Phase Angle* under which the equipment controls for a constant value of the phase angle as set.

(2) *Biased Frequency* under which the control is primarily for a constant value of phase angle but assistance is given for short periods in the control of system frequency whenever the frequency is not at 60 cycles at the time the phase angle controller sends a changing output impulse to the Morony generators.

(3) *Selective Frequency* under which the control is for a constant value of system frequency but impulses to change Morony output will only be made in a direction to assist in holding the set value of phase angle between the systems.

(4) *Flat Fequency* under which the control is for a constant value of frequency of the system on which the plant is operating and it is used only when the Montana system is not in parallel with Washington.

A description of operation since December 12, 1936, with the control equipment, novel in many respects, can not be undertaken in this brief statement. It can be said, however, that it has functioned as intended and about as expected; relieved the operating personnel of much of the tedious watching of the power interchange; decreased the number of telephone calls between operators and dispatchers; minimized manual operation of the controlling plant (Morony); permitted operation of the interconnection at appreciably higher load factors; and decreased the number of system separations due to manually uncontrollable power swings. It does not and probably will not completely control the power interchange automatically. Minor changes and adjustments have been made in the control apparatus and more may be found desirable with increasing amounts of operating experience. Analyses of the graphic kilowatt and frequency charts picturing the operation of controlling plants and tie lines indicate quite clearly that much improvement could be secured by increasing the speed of response between the phase angle indicator and the change in output of the Morony generators.

The automatic control of the phase angle was adopted in lieu of control-

* This discussion, included with Mr. Bankus' report, has been prepared by Mr. H. L. Melvin of the Ebasco Service, Inc. Mr. Melvin desires to acknowledge the assistance of Messrs. Cochrane and Turner, chief engineers of The Montana Power Co. and The Washington Water Power Co., respectively.

ling the kilowatt or kilovolt-ampere interchange at the interconnection point because it was considered as having the important advantages of (a) permitting operation averaging nearer the stability limit of the interconnection; (b) it should recognize and be readily adjustable to changes in system conditions both as to lines in or out of service or intervening load changes affecting stability and therefore the capacity of the interconnection; (c) the apparatus could be located at accessible and convenient locations for servicing and adjustment. For the particular application the phase angle control apparently has these advantages over tie line load control, though coordination with relay settings for selecting the preferable point for separation of the systems when excessive power flow occurs would be simpler with the latter scheme.

It is planned to continue study of refinements both in the operation of the equipment and in the basic operation of the interconnected systems with the objectives of reducing separations, increasing load factors on the interconnecting lines and reducing the manual component still necessary to successful operation of the systems.

Telemetering

The last few years have witnessed the installation of a large number of load telemetering equipments. In a large interconnected system it is difficult for the load dispatcher to follow the load changes when sole dependence must be placed on the ordinary type of telephone communication.

Through the use of telemetering equipments the dispatcher may be kept continuously informed regarding the loading of individual stations or as totalized to secure the most efficient operation of the system. Such information may be of very great value where the energy is purchased on a combined demand and energy rate. It is also of value in order that the dispatcher may be certain that sufficient capacity is kept in service all times.

The dispatcher's equipments may be of the indicating, graphic or integrating type. One pair of telephone wires is sufficient to transmit the totalized readings from a given point to the dispatcher's office.

Voltage Regulation of Distribution Circuits

The increased loads in residential and rural areas during the past several years have necessitated the installation of apparatus for improving voltage regulation in order to permit loading of the circuits to their approximate current carrying capacities without exceeding the limits considered satisfactory for voltage regulation. This need for additional voltage regulating capacity has led to the development of new types of regulating equipment for supplementing the more conventional forms.

Step-Type Regulators

A relatively new type of apparatus used for this purpose is the step-type regulator. The step-type regulator can be furnished for practically all voltages and all capacities. Its preferred field of application appears to be for regulating 3-phase circuits of 6,900 volts and up and for circuits requiring 100 kva. or more of regulator capacity. It is also extensively used in small capacities for regulating long 2400-volt single-phase branch feeders.

The following description by Mr. R. J. Davidson, engineer for the Pacific Power and Light Company, covering one of the Pacific Power and Light Co.'s installations, is typical for the 3-phase applications:

"We serve an isolated community by means of an 11-kv., No. 4 copper line about 30 miles in length. General load growth and fluctuating industrial loads at the end of the line and at a midpoint had caused a condition of voltage variation that had become unsatisfactory to appliance and cooking service customers. The addition of another sizeable industrial load near the middle of the line made it necessary to provide some sort of voltage regulation. A study of the load characteristics indicated that a step voltage regulator located near the midpoint and just beyond the first major industrial load should provide satisfactory results. This installation was made, using a 50-amp., 11,500-volt, 3-phase, automatic step-type regulator, having low percentage voltage taps and with a voltage range of 10 per cent buck or boost. This equipment has afforded very good voltage regulation to the community at the end of the line and has operated very satisfactorily. The time delay in the regulator was initially set at 15 seconds, and this caused an excessive number of operations of the tap changers. Trial of various settings showed that this time delay could be increased without adverse effect. At present it is operated with a time delay of a little more than 30 seconds and the number of operations has been reduced to about 15 per cent of that at the 15 second setting. No apparent difference in voltage reguation was noticeable with the greater time delay."

Shunt Capacitors

Shunt capacitors have been used for many years to improve the power factor of distribution circuits. Recently considerable interest has been manifested in this type of equipment as a means of improving voltage regulation and increasing the allowable current carrying capacities of distribution lines. This interest has been augmented by the improvements which have been made in the manufacture of shunt capacitors. The capacitor units are now much lighter in weight, lower in first cost, and may be obtained in small capacities in assemblies convenient for pole mounting.

Trans-Regulators

At least one manufacturer is building branch line transformers with built-in automatic voltage step-regulation in single-phase units in capacities as low as 15 kva. These units are referred to as "Trans-Regulators" and are available in one- or two-step regulation.

Series Capacitor

The series capacitor is another piece of apparatus which has recently demonstrated its value for regulating the voltage of certain types of distribution circuits. Being instantaneous in operation, it is particularly suited for regulating lines serving rapidly fluctuating loads.

Last year the Yamhill Electric Co., a subsidiary of the Portland General Electric Co., installed a 252.3-kva., 3-phase, 60-cycle series capacitor for regulating a 22,000-volt No. 4 copper line which is approximately 33 miles long. In addition to serving a fairly large rural area and a number of small towns, this 22,000-volt line serves four sawmills, all of which are located in the end third section of the line. Graphic charts of kilowatts, voltage and power factor showed very clearly that the frequency of the power swings was such that the voltage variations could not be taken care of by the ordinary step-type regulator.

After making a careful analysis of the requirements for this installation, a capacitor rating was selected which gave a drop of 2,900 volts (corresponding to 29 amps. and 100 ohms) across the capacitor at full load. At other loads the drop across the capacitor is, of course, proportional to the load current. The voltage across the capacitor is always opposite to the voltage across the reactance of the circuit. Its effect on the receiving-end voltage depends on the value of the load power factor of the circuit. For this installation the load power factor was approximately 80 per cent lagging. The series capacitor was located just ahead of the Ballston tap (approximately 16 miles from the step-down transformer feeding the 22-kv. line) in order to obtain regulation for both branches of the distribution circuit. With this installation the voltage at Sheridan (an important load center about 4 miles beyond the capacitor installation) was slightly higher at full load than it was at no load.

The above installation has now been

in operation for a period of 8 months and the results obtained check very closely with the original calculations. While the series capacitor is not a competitor of the step-type regulator when compared on a cost per kva. basis, nevertheless it has a field of application for which the step-type regulator is not suited. When making economic comparisons, the cost of the series capacitor installation is more properly comparable with the cost of increasing the capacity of an existing circuit or the cost of building an additional circuit.

In order to prevent any possibility of the maintenance force receiving a shock when coming in contact with the capacitor, the engineering department designed a special 6-pole, double-throw switch for cutting the capacitor in and out of the circuit. When this switch is thrown to one side, it cuts the capacitor into the circuit. When the switch is thrown to the other side, it disconnects and grounds both sides of the capacitor. The control handle for the 6-pole, double-throw switch is mechanically interlocked with the control handle for the by-pass switch so that no possible mistake can be made in the switching operations.

Distribution Transformers

Considerable progress has been made in distribution transformer design. Space in this paper will permit consideration of only two of these features, namely, the completely self-protected transformer, and the single bushing transformer.

Completely Self-Protected Transformer

One manufacturer has brought out a design which it terms the CSP or completely self-protected transformer. This transformer is equipped with De-ion gaps to protect against lightning, high-tension links to protect against sustained overloads, a low tension breaker to protect against dangerous heating, and a light to serve as a warning signal.

One of the advantages claimed for this type of transformer is that smaller capacities can be used with safety since the protective equipment incorporated in the design makes it possible to take advantage of the short time overload capacity inherent in the transformer unit.

Single Bushing Transformer

Single bushing transformers have been developed primarily for the purpose of reducing cost by eliminating as much of the auxiliary equipment as possible. These transformers are made in 1½- and 3-kva. sizes for primary voltages of 2,400 and 7,200 volts.

Carrier Current Control for Water Heaters

The Idaho Power Co. has been a leader in the application of carrier current control for water heater installations. An article in the November 28, 1936 issue of the *Electrical World* reports that more than 500 of the 7,000 water heaters on the Idaho Power Co's. system have been changed over to off-peak service, controlled by carrier current and estimates that this number will be increased to 1,200 in 1937.

Automatic Reclosing Equipments for Distribution Circuits

Considerable development work has also been done on low cost reclosing equipments for increasing the service continuity and reliability of small capacity distribution circuits. This deveopment has followed along the lines of repeating fuses and low capacity reclosing oil circuit breakers.

Repeating Fuses

Quite a number of the operating companies have made some use of repeating fuses. However, only a very limited amount of operating data is available to show the performance that has been obtained from this type of equipment.

Mr. C. C. Cornelius, superintendent, overheads systems, Kansas City Power and Light Co., gives the following experiences with repeating fuses for the period from June, 1934, to September, 1936.

Number of phase units installed	= 55
Months of phase unit operation	=1133
Phase operations	= 242
Reclosed	= 226 (93.4%)
Restored Service	= 148 (61.1%)
On second fuse	116 (47.9%)
On third fuse	32 (13.2%)
*Cases mechanism failed to function	16 (6.6%)
Note: *Mechanism failed due to sleet	5
*Mechanism failed contacts binding	6
*Mechanism failed swelling due to water	3
*Mechanism failed wrong setting by troubleman	2

Low Capacity Reclosing Oil Circuit Breakers

There seems to be a definite demand on the part of operating companies for low capacity reclosing oil circuit breakers which can be economically applied to low revenue lines. Several of the manufacturing companies have been active in developing such equipment and now are able to furnish this type of apparatus.

The requirements which a successful breaker of this type must meet have been set forth as follows by Mr. E. F. Sixtus and Mr. W. R. Nodder in the January, 1937 issue of *Electrical Engineering:*

1. "It must be low in cost—considerably lower than the conventional breakers now on the market. It must be simple to install, to keep the labor and cost of installation at a minimum.

2. "It must be simple to operate, so that it can be opened, closed or reset by an inexperienced person and thus save trained power company employes from making long trips to isolated installations.

3. "It must be suitable for outdoor service and for pole mounting.

4. "It must provide dependable overload and short circuit protection under all weather conditions with very little maintenance.

5. "It should provide at least 3 automatic reclosures with the first reclosure immediate if desired.

6. "It should be multipole with all poles opening simultaneously to prevent single-phase operation of three-phase equipment.

7. "It should trip on extremely low currents, about 10 amp. minimum, to provide dependable overload protection for lightly loaded lines."

Recent Mechan.cal Improvements

There have been many important mechanical improvements in various types of distributed apparatus. While the importance of such developments is fully appreciated, they have nevertheless been considered to be beyond the scope of the present paper.

Discussion

E. F. Sixtus, R. S. Daniels and *H. M. Jones* discussed thie operating performance of apparatus referred to by Mr. Bankus, chiefly reclosing switches and breakers. Mr. Daniels cited an instance where one of the new type breakers completed 29 operations without carbonizing the oil as much as five operations of the older switches would have.

Protection of Equipment from Over-Voltages*

By H. L. MELVIN
Ebasco Services, Inc.

*To be published in the July issue of *Electrical West.*

Distribution Transformer Loading*

By F. H. FERGUSON
Puget Sound Power & Light Co.

*Published in April, 1937, issue of *Electrical West.*

Discussion

D. A. Hord—The loading of transformers on the lines of the Northwestern Electric Co. has been surveyed over a period of years by routine tests using a Lincoln Maximum Demand Meter. These tests have revealed much information concerning the diversity of residence load, particularly electric range load, so that today we are serving a very much larger connected load of electric ranges in relation to the transformer capacity provided for this connected load than we used to.

A. B. Cayo—In the Portland General Electric Co. we have made tests on transformer loading a major order of business for many years. We use a split-core current transformer and ammeter and make six tests at each transformer, the two outside secondary legs of the transformer and the secondary mains on each side of it. This shows the balance on each side of the transformer and the load in each direction from it. We do our transformer testing in the late fall and winter beginning in November and between the hours of 5 and 8 p.m.

Our problem is not so much salvaging of excess transformer capacity since our loads are not over-capacitied. We have kept our transformer capacity down to a point where the transformers are well loaded during the peak periods and these tests are primarily to see whether the transformers need changing because of being over-loaded. A record of connected load served by each transformer is kept in the office and these field tests are to supplement and check these office records. When we cannot be sure from our ammeter test whether the transformer is dangerously overloaded, we use a thermotel.

Development of Low-Cost Distribution Systems*

By R. J. DAVIDSON
Pacific Power & Light Co.

*Published in March, 1937, issue of *Electrical West.*

Discussion

C. H. Hoge described the general construction standards used by the Puget Sound Power & Light Co. for rural lines in farm areas in which the prospect for extensive community growth or development in the next five years is remote. The multi-grounded, common neutral (type "MCN") system is used. This is defined as a system with a bare neutral wire used for both the primary and secondary neutral, with distributed ground not less than four per mile, including transformer grounds and guy wire bonds, but excluding grounds that may be made in customer's interior wiring. He showed pictures illustrating the type of construction covered by these standards.

Primary distribution voltage is 6,900, single-phase. Thirty-five-foot western red cedar poles are used except where longer poles may be needed to obtain adequate clarance. Number 4 A.C.S.R. bare conductor is standard for primary and secondary circuits with span lengths up to 500 ft. The common neutral conductor has as much carrying capacity as the primary conductor. Conductor clearances are 15 ft. above ground for secondary circuits and 20 ft. for primary circuits, with greater clearances over roads and highways.

Transformers are the single-bushing primary, three-bushing secondary type with case ungrounded and are bolted directly to the pole. One primary fuse is mounted on the primary bushing. No fuse or switch is placed in the neutral wire at any point. Transformers on the type "MCN" construction are not paralleled on the secondary side with other units, but each transformer supplies its own radial secondary system.

Service conductors of sizes up to and including No. 4 A.W.G. are soft-drawn, weather-proofed copper wire. Sizes larger than No. 4 A.W.G. are medium hard-drawn, weather-proofed copper.

A. B. Cayo described the standard practice of Portland General Electric Co. in constructing rural lines. Standard materials and construction practice are maintained, but in recent years the length of spans has been increased to a normal of 400 ft. and occasionally up to 500 ft. No. 4 A.C.S.R. conductors are used. Most of the lines are 6,900 volts with ungrounded primary but with the neutral of the secondary grounded. In several instances after the construction of single phase primaries for ordinary light rural load, small saw mills, rock crushers or pumping loads have come on requiring reconstruction of the line for three-phase.

M. H. Evans described the practice of treating poles on the system of the Molalla Electric Co. using arsenic. After a series of experiments, the most efficient penetration and distribution was found to be obtained by drilling a series of connecting holes around the outside of the pole. Into these holes is poured 3 gal. of 5 per cent arsenic solution, and if the pole was full of sap, a good distribution was secured. Dye is used in the solution to see what penetration and distribution is secured.

Progress in Public Service Is P. C. E. A. Convention Theme

A NEW precedent has been established for industry conventions. The 1937 model of the Pacific Coast Electrical Association all-industry conclaves, held May 20, 21, at the Hotel Huntington, Pasadena, Calif., adapted the philosophy of "blazing new trails", the theme of F. B. Lewis' 1936-1937 administration, by pioneering with a new type of program which held the interest of the 700 registered delegates at a high point throughout. It was a program of demonstrations of the newest developments in the industry staged so dramatically that not one wished to miss a moment of any session. And after witnessing them and viewing the supplemental exhibits, no one could come away without the firm conviction that the electrical industry is abounding in vitality and at the threshold of a promising future.

R. E. Smith, executive assistant, Southern California Edison Co., Ltd., was chairman of the convention. Under his guidance, the program was developed with the objectives of (1) proving to the men and women of the industry that progress and growth are accelerating; (2) showing them some of its newest developments so that they could adapt them to their own and their customers' problems; (3) demontsrating to the public generally its increasing dependence upon the industry for the essentials and luxuries of life and (4) showing that the industry accepts these greater responsibilities of public service readily and cheerfully. Significant is the idea that the program was designed to tell the story of progress not only to the industry but to its customers.

Both the exhibits and the demonstrations were selected with the idea of demonstrating electrical magic in the home, farm, office and industrial plant.

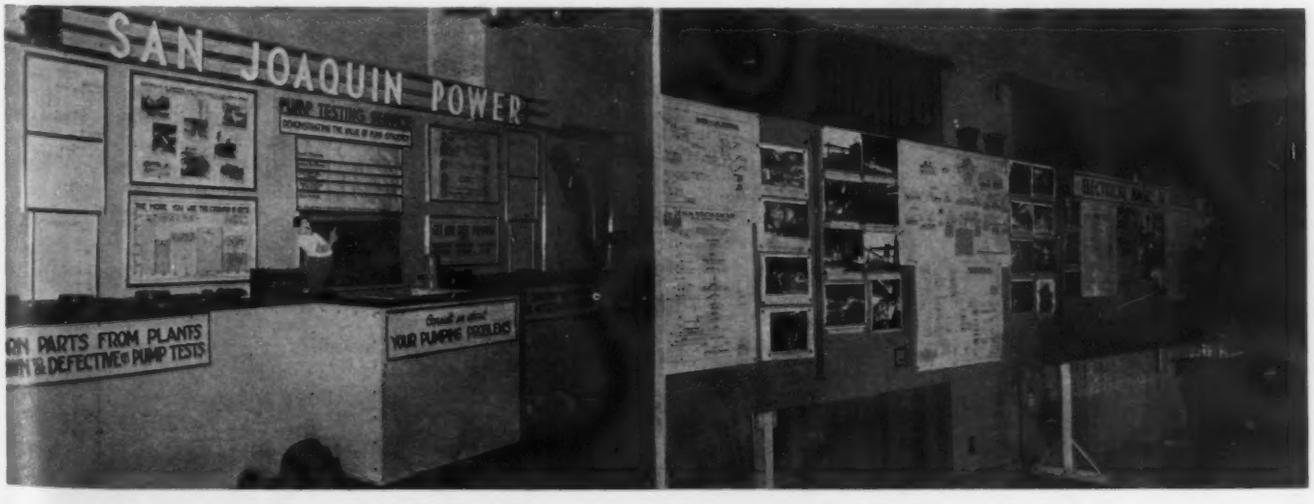
In addition to the presentation to the delegates, the main features of the program were presented again on the day following the convention to a group of 450 prominent industrialists of southern California who were invited to the showing. Thus the program and the exhibits served a two-fold purpose of telling the industry itself and its customers that electricity is finding new ways to serve.

During the presentation of the operating-economics section, A. W. Copley, Westinghouse Electric & Mfg. Co., as chairman, presented the awards to the writers of the prize-winning papers of that section's contest on how to improve diversity factor, power factor and demand factor in domestic areas. The winners were R. V. Pearson, Pacific Gas & Electric Co., W. A. Andree, Southern California Edison Co., Ltd., Los Angeles, Stanley A. Ward, Southern California Edison Co., Ltd., Los Angeles, and R. C. Blankenburg, Southern California Edison Co., Ltd., Santa Monica, Calif.

Adjourning after a day and a half of intensive work, the last afternoon and evening were devoted to recreation and entertainment. Golf competition,

President-elect Ray Alvord gets a pointer from President Fred Lewis

headed by golf chairman Harold Thrane, General Electric Supply Corp., included play for the Byllesby Trophy, the Pelton Cup and the Addison B. Day Cup, as well as numerous attractive prizes (see page 158 for the winners). For non-golfers, inspection trips to California Institute of Technology to witness the grinding of the 200-in. telescope lenses, the Griffith planetarium, and a Don Lee Broadcasting Co. television receiver were arranged. The annual banquet and an evening of dancing concluded the entertainment.



There were many educational exhibits. At the left is the setup San Joaquin Light & Power Corp. uses to sell farmers on the efficiency of electrical pumping. At the right are charts and photographs demonstrating various industrial applications of electric power

Ramblings in Research Give Glimpse of Future

RESTLESS scientific minds seeking the answers to abstract problems; ceaseless activity by engineers producing new equipment or unique process are the reasons for the continuing evolution within our industrial world. Occasional spectacular triumphs call public attention to the large army of technical minds supported by America's industrial institutions. Day by day the sum of technical knowledge is increased through the activities of this army of research workers and engineers.

Just how these achievements affect the trend of contemporary life was visually demonstrated by Dr. Phillips Thomas, Westinghouse research engineer, in a series of seven graphic demonstrations entitled "Ramblings in Research." Electrical phenomena developed in the laboratory were shown along with their practical application to problems of every day life. Included in the demonstrations were the following:

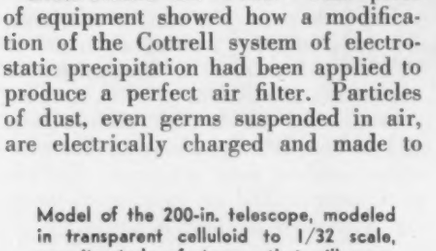
Electrostatic Air Filter—This piece of equipment showed how a modification of the Cottrell system of electrostatic precipitation had been applied to produce a perfect air filter. Particles of dust, even germs suspended in air, are electrically charged and made to cling to magnetized plates. Cigarette smoke was dissipated to show how the air is completely filtered. Practical applications of this equipment include the filtering of air in automatic telephone exchanges, motion picture film developing laboratories and sick rooms of asthmatics and hay fever victims.

Transmission Line Vibration—The phenomenon of "dancing wires" produced by a combination of sleet and wind which produce static unbalance and frequent line failures was demonstrated together with the correction obtained by dampening the vibration.

New Magnets—A new nickel aluminum steel alloy was shown whose magnetic properties were such that a one-lb. permanent magnet lifted a 20-lb. piece of steel.

A novelty demonstration of a new magnet steel. A steel ball in the bottom of a glass dish rotates around the bottom attracted by the pull of an unseen magnet below

Model of the 200-in. telescope, modeled in transparent celluloid to 1/32 scale, permits study of stresses that will occur in completed project. The instrument, double the size of the present world's largest, will be installed on Palomar Mountain in southern California



Stroboscope—This was a demonstration of the technique of analysing rapidly moving pieces of mechanical equipment by means of an improved gaseous tube light source having a high intensity adjustable-speed flash of short duration.

Breath Relay—This was a photocell-relay combination so sensitive that the moisture in the human breath was sufficient to actuate electrical circuits for a wide variety of purposes.

Burglar Alarm—This was a demonstration of infra-red light, invisible to the human eye, being used to actuate alarm devices by means of a photronic tube.

Ignatron Gun—This was a grid controlled thermionic tube which acts so swiftly that it apparently stops the image of a projectile in flight from a gun. With a speed of operation of one millionth of a second, the device is used as a single-flash light source for the photographing of non-recurrent phenomena and to time such processes as spot welding. Dr. Thomas explained that one millionth of a second represented the time interval necessary for an automobile travelling 60 miles per hour to proceed a distance equal to one fourth the thickness of a sheet of writing paper.

E. W. Morris, Westinghouse engineer, told about the tube-controlled reactance theatre dimmers and is shown here demonstrating a new stroboscope

•

New Uses Found For Electronic Tubes

PRACTICAL applications of electronic tubes in industry, particularly in lighting control, television and talking motion pictures, were explained and demonstrated by three speakers in a trilogy presented by the Operating Economics Section.

Harry R. Lubcke, director of television of the Don Lee Broadcasting System, explained why "television is still just around the corner" as far as the public is concerned. Under existing legislation and regulations governing the Federal Communications Commission, television is classed as experimental and hence non-commercial. In this respect it is in the same position as was radio prior to 1922. Without commercial sponsorship, there can be no revenue, hence no regular television broadcasting on a scale to encourage public purchase of sets.

Of interest to the electrical industry was his statement that a modern television set has double the capacity and therefore double the consumption of a modern radio set. He described the experimental work conducted by the Don Lee Broadcasting System in southern California since 1931. Early experimental work was with pictures having

Eddie Stauffacher, Edison Co. engineer, is demonstrating the Pacific Telephone & Telegraph Co.'s "hear-your-own-voice" demonstration. Sound waves from the transmitter are impressed on a metallic tape, in turn run through a transmitting device which repeats the message into the receiver

a 24-line screen produced by mechanical scanning. Today using the modern cathode tube, pictures having a 440-line screen are possible. Experimental broadcasting from a station in Los Angeles is being done with a 300-line screen, which gives 24 images per second.

Modern television receivers are self-synchronizing. Employing ultra-short waves, the Los Angeles station has a range of 50 miles, covers an estimated population of 2,000,000.

Simplicity, speed, compactness and fineness of control are features of the electronic system of operating theater dimmers described and demonstrated by E. W. Morris, engineer, Westinghouse Electric and Manufacturing Co. This modern application of electronic tubes has simplified theater lighting, making possible effects hitherto unobtainable.

How experimental work in automatic telephony developed first into orthophonic sound recording and later into talking motion pictures was explained by H. C. Silent superintendent-engineer, Electrical Research Products, Inc. By word and samples of the equipment used, he took his audience behind the scenes in motion picture sound production. The final illusion of sight and sound produced in the theater is a far cry from the original materials with which the sound engineers work. One single conversation with its sound effects may represent from three to fifteen separate recordings which have been simultaneously transcribed onto a single sound track with just the right degree of intensity for each.

He explained how the sound emitted by the theater loudspeaker has gone through 26 different changes of state from the original words spoken into an "eight-ball" microphone by one's favorite star. He predicted further improvements, both in sound reproduction and photography which will make the screen illusion even more perfect.

"Light Marches On"

COMBINE expert dramatization, forceful facts, and sound prophecy with interpretive executive comment and the result is a program feature that entertains, educates and stimulates constructive thinking. That is the formula applied by H. Freeman Barnes, sales promotion manager, Incandescent Lamp Dept. of the General Electric Co., NELA Park, to prove to the convention that "Light Marches On" at a rate that taxes the industry's ability to keep pace. Working with the most conservative of minimum values of light for seeing, Mr. Barnes built up the values of light-

H. FREEMAN BARNES
NELA Park's sales promotion Manager

ing required for effortless vision for more exacting tasks by actual demonstrations on the stage, using those compact new tools, the sight and visibility meters, to arrive at the correct prescription of intensity for each. The comparison of the actual values of lighting found in the average home, office and factory to those needed to preserve priceless sight were so marked that Mr. Barnes indicated a need for enlarged lighting service by the industry and introduced the idea of a broad-gauged "Sight Conditioning" program calculated to make work and recreation safe for eyes.

Interesting to everyone is the fact proved by the laboratories that certain commonplace tasks such as fine sewing, delicate, machine repairing, etc., require values of light for adequate vision without strain that exceed the ability of the most modern lighting sources. The development of lighting sources that will produce glareless illumination of levels of 750 or 1,000 foot-candles is occupying the research staffs at present. It was indicated that this activity gives promise of early success.

As pointed out by Mr. Barnes, most eye work requires 10, 50 and sometimes even 100 times the amount of light now supplied if eye-strain, nervous tension and undue physical fatigue are to be eliminated. In offices and factories, tests have shown that production is increased, errors minimized and health improved by the application of recommended levels of illumination scientifically applied. These advantages, desirable as they may be, do not include the humanitarian aspect of sight-saving illumination.

Nor is the effect upon the nations' vision possible of evaluation considering the elimination of eye defects through proper school lighting. Today eye defects of children increase six fold, from 5 to 30 per cent, during the time of schooling, a lamentable situation that could be largely eliminated by providing safe lighting for studying.

Taking the requirements of lighting for eye conservation and combining them with the known trends in public acceptance of the Better Light-Better Sight program, the audience was shown the marketing possibilities for lighting sales and the energy requirements for lighting in the future. At the present trend, the 350 kw.-hr. used by the average home in 1937 will have grown to 1,000 kw.-hr. in 1947. During the same period, commercial installations will increase use from an average of 3,800 kw.-hr. annually to 12,600 kw.-hr. an-

High frequency generator sets up a field capable of lighting gaseous tubes brought within its vicinity

After a five-year interlude there was much of mutual interest to discuss at this convention. From left to right: Gus Pahl of KPF Electric and Jim Crilly of General Cable listening to D. D. Smalley of San Joaquin Power tell how load is growing in the valley; President Jim Black of P. G. & E. tells President Emory Wishon of San Joaquin Power that the convention is a huge success; Nat Callard of Westinghouse and Al Strong of Coast Counties Gas & Electric concur; load-builders H. W. Edmund of Coast Counties, H. H. Courtright of Valley Electric and F. U. Naylor of P. G. & E. also agree

nually and industrial light will grow from an average of 32,000 kw.-hr. to 110,000 kw.-hr. This increase will require additional energy output of approximately 1,250,000 kw.-hr. per 100,000 meters. The market of the sale of lighting devices and wiring will amount to $5,500,000 per 100,000 meters made up of residential lighting sales of $3,000,000, commercial and industrial of $1,000,000 and wiring supplies of $1,500,000.

In view of these potentials, the electrical industry apparently needs to alter its sales philosophy to conform more nearly to the job to be done. The common objective of a 10 per cent increase annually does not meet the situation and most certainly will not stimulate the rapid development that is possible with its attendant greater profits to all branches of the industry. Despite the tremendous increase in the numbers of lighting sales people telling the story of lighting to the public, the staff utilized for that purpose is still too small. In 1933, the utilities employed 1,200 lighting salesmen, practically all men. In 1937, they employ 2,500 men and have introduced some 2,700 home srevice women to the public. The actual requirements, to completely capitalize on the lighting sales potential, are estimated to be 4,000 men and 10,000 women.

Indicative of the ambitious plans held for the future by the lighting branch of the industry are the possibilities of not one, but two or more, 1,000-watt lighting units in the living room of the home, of having average levels of 100 foot-candles in the small shops and stores with spot and counter lighting of four to five times this figure, of complete reclassification of factory lighting recommendations upward with common values of 300 to 500 foot-candles. School lighting, with photo-electric control to insure complete eye protection, should and can be raised to average levels of from 30 to 50 foot-candles by a properly executed program to education among school boards, parent-teacher organizations, etc. If these objectives seem unduly ambitious, Mr. Barnes asked the audience what the prophet of 1933, scarcely three years back, would have been called had he made the statement that, by the end of 1936, a million 500-watt lamps would be in use in American homes. Because the 500-watt IES lamp has sold in that volume and because its sales are growing at a rapidly increasing rate, the prophet of 1937 probably cannot err except on the side of conservatism.

New Load from New Lights

IMPRESSIVE in its scope, and indicative of the rapidity of the development of the science of lighting, the address of Alston Rodgers, Incandescent Lamp Department of the General Electric Company, Los Angeles, reviewed the progress that has been made in lighting methods and presented a demonstration of the newer light sources. Beginning with the discussion of the cost of lighting to the consumer, Mr. Rodgers pointed out that, in recent years, improved design, better production methods, and a continual reduction in rates have made possible an enormous increase in lumen hours per cent of expenditure. Light sources, also, have been reduced in size permitting more flexible application. Illustrative of this was a peanut-sized, high-pressure mercury vapor lamp, which, when water cooled, was rated at 1,000 watts.

As lighting levels recommended for schools, offices, and other places have increased, high wattage lamps have become so large as to present a distinct handicap in the appearance of the room. This has led to the development of a 1,000 watt, bi-post base, tubular lamp only three inches in diameter. This lamp is equipped with a filament screen which collects most of the blackening ordinarily deposited on the bulb and thus gives considerably better maintenance in candle power throughout its life. A bulb having a silvered interior on its lower half is now on the market and makes it possible to obtain indirect, well-distributed lighting. As a luminaire of a minimum cost, this light has the additional advantage of maintaining higher efficiency because dirt cannot collect on the reflector.

In industry, several new light sources are now available. Hood-type lighting units over the shop bench are designed to give adequate illumination with low wattage units. Where very close work is required, experimental units have been made to provide up to 10,000 foot-candles. Typical of these special applications, is a new hospital unit having a 350 watt lamp (with two filaments for safety) illuminating the operating area to 3,500 foot-candles. Also a tremendous improvement in industrial lighting is the new heavy duty portable lamp with safety guard. This unit will withstand repeated severe shocks without damage.

For better merchandising, the lighting industry has developed the over-counter, ceiling-suspension unit reflecting light upward to the ceiling and downward through a section of fresnel lens directing the counter light into a narrow ribbon along the counter. Lighting rented premises at low cost is practical with the new indirect case-top units which can be placed at various locations around the store to illuminate case-top merchandise, or to give indirect lighting from light-colored walls. Several new lighting units which screw into an existing socket permit the low-cost and attractive lighting modernization for the small shop or store.

According to Mr. Rodgers, wise merchandisers are taking more and more advantage of the luminous paneling in all its ramifications. Flashed, opalescent glass has been used effectively and has given rise to developments of other translucent building products such as Vitrolux, a tough, almost unbreakable glass; glass bricks; and finally, especially treated marble which, when illuminated from behind, gives a rich, warm color enhanced by the pattern of the marble itself.

An array of the newer light sources created considerable interest. Of these,

a new mercury lamp gives 1½ times as much light per watt as the general service Mazda lamp. Used with Mazda lamps, the combination approaches white light and mixes much better with daylight. The office, shop, or school lighted to high levels in such a manner has less radiant heat to be disposed of. New gaseous tubes with a powder coating inside give light by florescence with an efficiency approaching 30 lumens per watt. They also have high color efficiency as well as a range of "white" light obtainable by suitable mixtures of the powder. Of interest to photographers, motion picture producers. and others demanding extremely high intensities of light for short periods, were a new photo-flood light and a repeating photo-flash bulb which will soon be placed on the market.

Another interesting development is the experiment with gaseous tubes operating in a high frequency field. In such a field, the gaseous tubes glow with their characteristic colors without electrical connection. The idea has been adapted successfully to novelties such as ash trays, vases, etc., and has been used to good decorative effect in restaurants, cocktail bars and other similar locations. Their use, of course, involves the production of a high-frequency field at each of the locations where these devices fit.

As pointed out by Mr. Rodgers, the foregoing are but a few of the new developments which will soon be placed in the hands of the industry to enable it to give the consumer better light for seeing, better light for merchandising, safer highways, and more beautiful decorative effect. The continual reduction in the cost per lumen of light obtained, as well as in the first cost in the lighting equipment and its control, make lighting still one of the "best sellers" in the industry. The development in technique and basic knowledge from which new products and practices have been created have been accorded eager public acceptance and give promise of nothing less than a complete revolution in conditions under which our eyes will be used in the future.

Local Wiring Program Suggested in Skits

HOW a town or city, the town of "Progress" for example, can really do something about the problem of wiring was made the purpose of the Thursday evening meeting. Termed a Wiring Clinic, the program consisting of prologue, three skits and an epilogue, presented by the Business Development Section, was billed as "a melodramatic autopsy in six acts, diagnosis and remedy" and presented by a group of Edison Company sales employees under the direction of Henry C. Rice, vice chairman of the Section and merchandising manager of the utility. Frank J. Airey, chairman of the P.C.E.A. wiring committee, southern section, was chief diagnostician, and Ray Taylor, of Santa Ana division of the Edison Co. wrote the skits. The program was prepared as a result of several meetings and discussions to evolve a wiring plan in which the following participated and contributed: J. O. Case, A. L. Stone, John A. Duncan, J. J. Newitt, representing contractors; H. H. Douglas, R. G. Kenyon, Ray Taylor, H. C. Rice, representing utilities; R. H. Manahan, Frank Short, Arthur Veit, representing inspectors; W. A. Cyr representing "industry consciousness" through the press, and Harold Thrane, A. E. Hitchner, Frank J. Airey representing manufacturers.

A. H. Nicoll, chairman of the section introduced the evening program by pointing to the urgent need for more adequate wiring and suggesting that many workable ideas could be gleaned from the skits. Henry Rice introduced the problem or "diagnosis" with a clothes line full of the industry's "dirty linen", the torn shirts and bloody remnants of the squabbles and cat-and-dog fights to which the industry has devoted all of its energies during the past eight years.

Among these pieces of "dirty linen," the obstacles to wiring progress in the past, were seen: allegations of high cost of wiring, curbstone contractors, lack of consumer appreciation, selling an intangible—behind the walls, codes and ordinances, cut-throat competition, public indifference, industry inertia, lack of a coordinated plan, lack of immediate reward, architects' attitude, lumber yard plans and wrapping paper specifications, competition of other industries, and inter-industry squabbles.

The first skit depicted a group of community leaders, brought together to discuss what might be done to improve a local situation. Among the group were the leader of a women's organization, a city official, a real estate man, a building contractor, a banker and an electrical contractor. Each told how desirable more adequate wiring would be and kept passing the responsibility back down the line to the banker, and finally the electrical contractor. When the banker told the latter that financing of wiring for old homes was available on an easy pay plan without recourse to the contractor the contractor determined to do something about it.

Carrying the message to the trade was the theme of the second skit. A similar group discussing the job ahead consisted of the wholesale salesman,

Some enjoyed the covention while others worked to make it the most successful in the history of the P. C. E. A. From left to right: W. B. Euler of P. G. & E. and Carl Heise of Westinghouse liked the whole show; workers were Al Copley, chairman of the Operating Economics Section, Al Nicoll, chairman of the Business Development Section, and A. B. Carpenter, vice-chairman of the Administrative Services Section; talking over mutual advertising problems are R. G. Kenyon of Edison and Al C. Joy of P. G. & E.

Wiring was subjected to a melodramatic autopsy which included both a diagnosis and a prescribed remedy

utility representative, Kelvin Home man, Westinghouse and General Electric representatives. The force of national publicity given to the New American Home, the Home of Tomorrow, the Kelvin Home, the Niagara Hudson "Five Star Home", the Red Seal plan, and the Handbook of Interior Wiring Design, were cited as various media for the preparation of the public to demand more adequacy. The contractor accepted the challenge and went to tell it to his men.

Third skit was a scene in which a man and his wife planning to build a home, the architect, building contractor and an electrical industry wiring salesman discussed the problem of future comfort, convenience, safety, and resale value of the intended home and in which the husband finally decided to consider giving up some other nicety of detail in the finish of his home in order to provide for future electrical convenience.

A huge treasure chest of opportunity for the industry was brought in at the concluding epilogue. Here Mr. Rice explained that the "dirty linen" could be replaced by new opportunities. These golden banners proved to be "the whole industry sells electric advantages", "provisions for future growth—the all-electric home", "Red Seal specifications—promotional plans", "selling up, by informed contractors", "continuous barrage of consumer information", "awakened public interest", "breezy sales campaigns—we have a plan", "greater sales opportunities".

The final punch was introduced on a huge board which carried the slogan, "See 'em, Tell 'em, Sell 'em."

Although held in the evening and in competition with a dinner party given to all the executives by the Westinghouse company, the meeting had a good attendance, many contractors and others who had not previously attended any of the sessions attending.

Electrical Magic in Agriculture

By JOE K. ELLSWORTH
Department of Entomology, University of California

THE conservatism of the farmer is by no means the only obstacle with which our so-called electrical magic must contend. An even stronger opposition is that afforded by the self-interest of commercial concerns which electrical methods would replace. An illustration of this point is the opposition of the chemical companies, oil companies and many others against the development of a method of controlling insects by means of electrical equipment, because they have profited greatly from the practice of spraying, dusting and fumigating for insect control. In some cases you will even find obstacles in the form of legislation restricting the use of electricity, and you are all well aware of the fact that such legislation can only be successfully opposed by well organized group action.

The Committee on the Relation of Electricity to Agriculture and the experimental laboratories such as those of the University of California may be able to prove conclusively that electrical farm projects are sound and practical, yet before they enjoy general acceptance, it will require the united effort of the electrical industry. Here are a few of the 35 projects in which this committee has participated:

Blowers for Frost Protection—Is the use of aeroplane propellers in orchards as a protection against frost damage practical? Increasing popularity of this equipment during the past five years accounts for the installation of over 100 of these machines in the state at a cost of approximately $2,500 each. They are driven by electric motors of 50 to 250 hp. Observations indicate that they have some merit although there are certain limitations which undoubtedly restrict their application.

The Electric Fence—Experiments are being made to determine its practicability and limits of voltage and current which should be used to insure safe and proper operation.

The Electric Garden Tractor—During the past two years experiments have been made with a machine driven by a 1½-hp. variable-speed reversible motor mounted on a chassis and driving a rototiller. Power is transmitted by a cable wound on an automatic reel and kept off the ground by a mast. It is very successful for small areas.

The Electric Pig Brooder—During cold weather young pigs crowding against the sow for warmth are injured or crushed to death. One brooder consists of a triangular shaped hover with a 12-in. hole in the top over which is placed a reflector containing a 100-watt lamp.

The Electric Insect Electrocutor—During the past eight years we have carried on experiments with certain of our major insect pests, namely the grape leafhopper, the coddling moth, the tomato hornworm and tomato fruitworm, some of the dried fruit insects in warehouses and drying yards, mushroom insects, mosquitoes and the Clear Lake gnat.

Using one trap per acre with a high intensity pale blue gaseous tube as a light source, with installation costs averaging $25 to $35 per acre, production of Thompson seedling grapes ran as high as 12 tons per acre against a statewide average of 5.2 tons. These grapes sold for $16 per ton, which was $4 a ton higher than the price received by neighboring vineyards.

Experiments are being conducted on coddling moths and tomato pests that indicate considerable promise. For mushroom and dried fruit pests, the lamps have all ready demonstrated their feasibility. Tests will be conducted this year on the lima bean pod borer which

Convention attendance and interest brought smiles to executives as demonstrated by Association Vice-President W. R. Marshall of Westinghouse, Edison's President Harry J. Bauer, P. G. & E.'s Vice-President John P. Coghlan and San Diego Consolidated Gas & Electric's President W. F. Raber

caused losses of $317,000 in three California counties alone in 1935.

So you see that today, the use of colored lights to lure destructive insects to their death on wires of an electrified cage, and at the same time to avoid the problem of poison spray residue, is an accomplishment that a few years ago seemed unattainable. As a matter of fact the success of this means of control has been so striking in a few instances that this very success imperils the whole investigation; that is, too many look upon this method of control as the answer to all of their insect problems. That, of course, is impossible because there are many limitations, a few of which we wish to point out.

Until further investigation reveals something to the contrary, our work is limited to night flying insects. Relatively little is known about the night activity of most of our major pests. Little knowledge is available as to their flight habits, particularly the period of flight, the height of flight, the distance of flight and many others, all of which must be known in order to locate the traps properly and time their operation. Also, properly locating the traps is a problem of engineering which must be done by one familiar with them.

When Disaster Strikes

IF AND WHEN disaster strikes Los Angeles County, it will find local authorities ready to operate under a far-sighted, well-thought-out program designed to alleviate panic, minimize losses and speed the return of normalcy. According to Undersheriff Arthur C. Jewell and Captain L. J. Hassick of the Los Angeles County Sheriff's office, who described the functioning of that county's disaster plan to the convention, the maintenance of normal public services, particularly electric power, is vital to the success of such a plan, not only from the standpoint of rescue and relief work but also to stiffen public morale. These men paid high tribute to the utilities of the county, particularly the Southern California Edison Co., for the cooperation and backing which made the plan possible.

As described, the Los Angeles disaster plan embodies: (1) rescue and the suppression of any fires occurring; (2) temporary rehabilitation and reclamation including hospitalization of the injured and shelter and sustenance for the survivors and (3) accelerated permanent rehabilitation and reclamation of the area. The plan is based upon the coordination of available resources, and their utilization in an efficient manner to accomplish the above. The organization which takes over in times of emergencies is headed by the sheriff's office and staffed by the heads of county services such as health, relief, etc. An advisory council consisting of representatives from the public utilities, American Red Cross, the military, together with federal, state and municipal authorities provides assistance in their respective fields. With this organization functioning through an administration center and a communication center (the latter utilizing private circuits of the Edison Co.) relief squads are dispatched and controlled, supplies moved into stricken areas, public movement within the county controlled and the facilities of the county mobilized to a high degree of efficiency.

An essential part of the program is the maintenance of electric power in the area. In the Long Beach earthquake of 1933, no electrical fires were reported nor lives lost as a result of this policy. It is essential that power supply be maintained because the forces of relief and rehabilitation could not function without it. First and most important, fire and flood control pumps are largely electrically driven. Floodlights must be available to aid in rescue work. Communication, particularly radio broadcasting which is often the only means of directing rescue squads, depends upon the utility. Public health, always endangered by disaster, depends upon functioning of sewage and water supply pumps. Hospitalization and medical care rely upon power for lighting surgeries, operating X-ray machines and other therapeutical devices. Even refrigeration is important in the light of protecting food, particularly milk during an emergency period.

In providing food, the electric utility can set up electric ranges in concentration areas and provide a safe and often the only means of meal preparation. This was demonstrated to advantage during the Long Beach shake when the Edison company provided such facilities almost immediately.

In the Los Angeles plan, the emergency organization depends upon the utilities for just such services and in addition leans upon them for engineering advice, communication, and for repair equipment which can be quickly concentrated. Within the utility itself, a small scale emergency plan is ready to operate when emergency demands that the company meet the highest test of public service, that of human relief.

Conventions such as this one are good for the industry. From top to bottom: President-elect Alvord is congratulated by his G-E co-worker, Sam Gates; University of California's Joe Ellsworth specializes in electrocuting bugs, saving the farmers money; Frank Angle of Allis-Chalmers has just learned about the early days from the old family picture gallery; Chairman Earl Fisher of the Administrative Services Section is about to learn about regulation from Railroad Commission staff members Ed McNaughton and E. A. MacCaffrey

The Industry Looks Ahead

GREAT as our industry is in its aggregate of investment, kilowatts, or customers, it will always be a local business. The huge total is merely the sum of millions of transactions with millions of customers. The way in which these many transactions are handled will spell the success or failure of each company. The local problems are therefore the most immediate and essential ones.

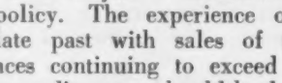
The problems for the future which seem to loom up largest at the present time are: (1) our public relations in the communities we serve; (2) the entry of government into our business; (3) our sales policy; (4) rural electrification; (5) rising cost of operation; and (6) ability to finance.

As to public relations, I believe the one way to have and maintain public confidence and respect is to follow policies and methods which deserve them. We must take ourselves seriously, but not too seriously. We must remember that the interest of the public in our business is limited to obtaining from us the best possible service at the lowest feasible cost. In following out this interest, actions speak louder than words. I believe the industry has concentrated on this basic problem of service and rates with greater success in recent years than for many previous years. I should hope and expect to see the process continue unabated in the future. The Government has been shouting "Wolf!" about the utilities for years, but the cry has less and less effect when all the public finds, when it goes out to get the wolf, is just a constant series of rate reductions and improvement and extension of electric service.

If past experience alone were our guide, we should be justified in feeling that, country-wide, over a 50-year period, the American people were definitely of the opinion that they could get their electric service better and more cheaply from privately-owned utilities under public regulation than through municipal ownership. Municipal ownership reached its zenith 35 years ago. In 1902, 9 per cent of the electricity manufactured and sold in the country came from municipal plants. Today the ratio is about 6 per cent.

In view of this record we might view the future with some equanimity, for the big Federal grants have been publicly offered for several years. It is true that 60 proposed donations to cities for the erection of municipal electric plants have been held up by injunction and some of these may eventually be allowed by courts of appeals. But, offsetting this, the record shows that of 5,735,000 votes cast in municipal elections in 1936 on the subject of municipal ownership of utilities, only 27 per cent were favorable to it. It must be that our sticking to our knitting and steadily extending service and reducing rates has had a favorable effect on people's minds.

The next subject I mentioned was sales policy. The experience of the immediate past with sales of major appliances continuing to exceed those of the preceding year should lead to the definite conclusion that there should be no relaxation in sales effort during the coming year. It is part of our public duty respecting service and rates to get



By C. W. KELLOGG
President, Edison Electric Institute

the labor-saving and convenience of electricity diffused among the people as rapidly as possible, especially as the effect of the process is continually to reduce average rates. This in turn will help our public relations and will keep our organizations keyed up to the highest state of efficiency.

Rural electrification has been magnified in importance in the last two years as part of the general moves by the Government to improve conditions for the farmer. The effort has been made by the REA to make it appear that the electric utility companies are opposed to the extension of electric service to the farms. Getting electricity to the farms is surrounded with economic difficulties arising from the nature of the problem, the principal ones being the relatively high investment cost per farm where the country is sparsely settled, the inability of many farmers to raise the money to pay initially for the equipment and wiring necessary to use electricity, and subsequently to purchase the electricity. These economic difficulties still persist even if the rates for the electricity alone should be the same rurally as in the cities.

My next subject is that of rising costs. The reason average rates for the home can be brought down by increased consumption per home is that there is a progressively larger quantity into which to divide the relatively fixed part of the cost of service. All goes well with the process until the unit cost of the expense items themselves begins to climb. With the present rising trend of taxes, payrolls and materials, we are definitely in this situation at the present time. The inevitable effect will be to slow down the process of rate reduction and, if the inflationary trends continue, to stop reductions entirely and then to produce the reverse effect, namely, rate increases. Recent checks in the rise in price of raw materials are distinctly encouraging, and another factor not to be forgotten is the stimulation to sales resulting from lower average rates themselves. We are now witnessing in our business, and will continue to in the immediate future, a race between sales and inflation. The latter has been gaining lately; may we hope for nothing worse in the end than a dead heat. The whole situation certainly points to the desirability of continuing the most strenuous and effective sales effort.

To sum it all up, the electric utility industry in the last few years has faced the attack of the most powerful propaganda machine the Federal Government has ever organized, backed up by large subsidies of taxpayers' money. The industry, as I believe wisely, has met this by the most effective method possible; namely, extending and improving its service and lowering its rates. Our task for the future is to continue this process as loyally and energetically as we can, firm in the belief that in the end our efforts will be appreciated by the public we serve.

●

"Family Album" Recalls Early Days of Association

To bring back memories of 20 years ago, when the P.C.E.A. was first started, a gallery of old pictures was exhibited in the lounge of the hotel. Pictures of 20 years ago and even of 30, 40 and 50 years ago, as well as some more recent, were mounted on big panels. Each of the utilities in the association contributed precious pictures from its archives, as did likewise manufacturers, contractors, and wholesalers.

Of peculiar interest were pictures taken at the first N.E.L.A. convention to come West, in 1920. It was held at the Huntington Hotel also, and pictures of the crowd, and of entertainment features excited interest and reminiscence. Appliances of about 20 years ago also were examined with curiosity and fond memories.

Yesterday and Tomorrow

Editor's Note: After contrasting the industry in 1917, the year the association started, with 1937, and pointing to the numerous developments made and the responsibilities the industry had accepted during the period, Mr. Mullendore spoke of the challenges to enterprise remaining in the solution of such problems as more adequate wiring, aid in reducing traffic accidents, and other vital improvements, he dramatically concluded his inspiring address in these words:

As we contemplate the vast, unexplored possibilities which lie ahead, the importance of keeping alive that spirit of enterprise and initiative which has been productive of our past progress is emphasized.

In some quarters, the opinion seems to be held that we in our industry are not sufficiently progressive or liberal, one writer recently suggesting that a liberal in our ranks is "as rare as a purple cow". This imputation of illiberality strikes me with particular force because it is so exactly contrary to my knowledge of the membership of our industry,—where I have found in my experience Liberals are the rule rather than the exception. To check on my opinion, I turned to the dictionary to find the definition of the word "Liberal". Amongst other definitions, I found that a Liberal is one who is receptive to new ideas, who is friendly to suggestions of new ways of doing things which seem to offer improvement and progress. The Liberal in action is one who fights for freedom.

What group in America, industrial or otherwise, has a better claim to the designation "Liberal", when it is so understood? Here is an industry which has been at the forefront of progress in the most progressive nation in the world. It has been and is now made up of people who are preeminently willing and anxious to try all new methods which offer promise of expanding the service which we are performing for the public. Here is a modern American business group who, in less than half a century has taken this new agency of progress, and so developed its usefulness that today the very lives of all our people are dependent upon its constant availability. These people who are accused of being illiberal and unprogressive, through the constant improvement of their service and of their equipment and appliances have succeeded in bringing their products and their service in ever-increasing quantity and at ever-decreasing cost to a larger and larger section of the public.

Hundreds of millions of slaves have been put at the service of the American workman and the American housewife. Yes, all that is an old story. Those facts are trite and worn from frequent repetition. Yet it is in the face of those facts that these charges are made, not only about the lack of liberalism but of unfaithful stewardship which we hear all too often from reckless and uninformed sources.

It is comparatively unimportant that an occasional uninformed writer or demagogue makes such false accusations. It is relatively of little consequence whether we are called Liberal or Conservative, but it is of the utmost consequence that the public whose electric service is at stake should not be misled into a course of action which will stifle the enterprise and thwart the development of this vital, basic industry. It may not greatly matter to society as a whole whether particular individuals are given due credit for their contributions to the development of our industry and their service to the public. But it is of the utmost importance that the public should understand that the great inventions and improvements which have made possible the full service of electricity as we know it today did not just happen. There was a very good reason why they did not happen in other countries, and the people of the United States must awaken to the fact that the accomplishments of their industries have been due much more to the freedom of opportunity and the encouragement and inspiration afforded by our free institutions than to our other natural resources. Destroy our freedom and our enterprises will decay regardless of our resources.

By W. C. MULLENDORE
Executive Vice-President
Southern California Edison Co. Ltd.

And we must not forget either the importance of maintaining confidence in ourselves. There have of late crept into our ranks at times some signs of discouragement and fear of defeat. That attitude will not prevail. It is unworthy of our heritage and tradition. It is true that we have been subjected to unfair competition and gross discrimination by governmental agents and agencies. We are today possessed of that courage and confidence which is born of the knowledge that in the face of bitter and unfair assaults, we have grown in strength. The children of adversity are not always the unfortunate.

Another task of tomorrow, then, is to revive public understanding, to fight off the false liberal, to continue the fight against strangling, stifling, regimentation, to maintain confidence in ourselves—a confidence and courage which demands fair treatment because we are entitled to it.

There are many more worlds to conquer. The Electrical Age has indeed but just begun. And let us not forget that the achievements of the past were due to the American idealist in the business world. And who is he? He is the man who is working out a dream,—a dream of a greater future, moulded along lines which will differ in detail with each dreamer but which are always motivated by a search for the better, the finer and the improved. It may be the dream is in some respects self-centered, in that its realization is spurred on by a desire for self-expression and recognition, but always it is a dream of achievement. The path to that goal heretofore in America has been fairly well-defined. The first and foremost rule was that "you must deliver the goods,"—goods which in one form or another contributed to public advancement and through their merit win public acceptance. If you could deliver the goods you would be rewarded—that was the rule. And so we have had thousands of minds at work in an endeavor to devise new goods to deliver, new and improved ways to contribute something of value to American life and American ways of living.

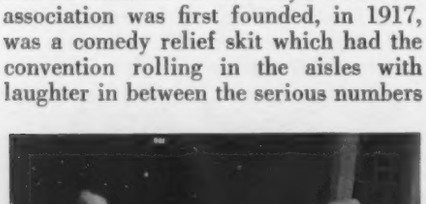
No other American industry has been more typical of or more the product of our traditional system, and in no other has the essential soundness of its central idea been more clearly demonstrated. Hence the challenge of this year 1937, two decades after that other critical year 1917, is this: To maintain our leadership, to make those further contributions to improved living, which we now foresee, we must continue to fight for the maintenance of freedom from governmental domination and

regimentation,—that freedom which has thus far nurtured our progress. Let us serve notice, not boastfully, but firmly, that we do not propose that this great agency of human service shall be sacrificed on the altar of cheap politics; that we intend to carry on at the head of the procession,—that procession of great industries which are the product of faith in and practice of the great principles which made the old America.

●

"Marvel of Radio" Lays 'em in Aisles

Appropriate to the theme of progress and in contrast to the days when the association was first founded, in 1917, was a comedy relief skit which had the convention rolling in the aisles with laughter in between the serious numbers



Glad when the convention was over was Edison's R. E. Smith, general convention chairman, and his wife

of the Friday morning program. Carl Haverlin, sales manager of station KFI, presented what proved to be a most hilarious stunt when he gave a lecture and demonstration of radio as it was in 1922. By careful planning of a cleverly assembled recording and with excellent pantomime he let the radio of 1922 tell its own story.

Beginning seriously he said that he was giving a lecture and demonstration of radio as it would have been given in 1922. Then explaining that Secretary of Commerce Hoover had granted KFI permission to occupy a certain wave band between certain hours, and that a new station, whose size was so big as to cover an entire table top, and employing tubes that cost all of $12 apiece, he went on to demonstrate the "latest in radio receivers, the little Gem." This open coiled, four condenser relic with a familiar ear horn separate from the set was brought in and "tuned in." The sound system in the auditorium then brought forth the cleverly prepared recording of station announcements, thin, tinny music, mixed stations, whoops and squeals, to which Mr. Haverlin carried on a nonchalant pantomime of a radio fan perfectly satisfied with the "marvel of radio." High point of the garbled broadcast was a sensational attempt made to pick up the music of Abe Lyman's orchestra direct from the Ambassador hotel, a full three and a half miles away from the studio. The attempt failed.

By way of contrast, at the end of the exceedingly funny old time broadcast Mr. Haverlin brought in one of the very latest and finest instruments, a big, all-wave, wide range affair with phonograph combination. He went over to it and told of all the marvelous programs that could be obtained today and made as if to tune in several stations, all of which advertised some rather cheap device or commercial service.

When he had concluded a representative of the Scott company, manufacturers of the custom-made receiver which was being shown, told of its wide tonal range, its radio frequency band capabilities and unbelievable number of tubes, and then just about drove the audience out of their seats by playing an orchestral record of Wagners "Die Walküre" at the full volume of set. Its tonal fidelity was as amazing as its tremendous volume potential.

●

Divot Diggers Hail New Champions

Two hundred golfers renewed play for the three P.C.E.A. golf trophies which had been out of competition for the last five years. Competition was close and interest keen, not only for the trophies but for the many tournament prizes which had been provided.

Harod Thrane of G-E Supply Corp. won the coveted Byllesby cup with D. Porter Vail of C. C. Moore & Co., runner-up. The Pelton cup was won by Joe Pengilly of Square D Co., with George Decker of the Edison Company and P. M. Downing of P. G. & E. close behind. The Addison B. Day trophy went to R. S. Pierce of the Edison company who successfully matched with R. N. Drieman of Coast Counties with whom he had been tied. Other winners were:

First Flight: C. E. Smoot, Smoot Holman Co., first; W. C. Cranston, Thermador Electrical Mfg. Co., and Emmett Jones, tied for second.

Second Flight: C. D. Shedenheld, Edison Co., first; W. J. Wilt, Bussman Mfg. Co., second.

Blind Bogey: Pete Affolter, Garland-Affolter; Frank Angle, Allis-Chalmbers; R. J. Cobban, Westinghouse; E. R. Northmore; A. E. Hitchener, Westinghouse and Phil Carson, Graybar.

Ray Alvord Elected 1937-1938 President

Indicative of the determination to make the Pacific Coast Electrical Assn. an all-industry organization, Raymon M. Alvord, manager of General Electric's Pacific District, was elected president of the association for the coming year. He is the first non-utility man to head the association since its organization 20 years ago.

Mr. Alvord was born at Scales Mound, Illinois, in 1883. He was graduated from Iowa State College in 1904 with the degree of B.S. in electrical engineering and immediately entered the G.E. test course in Schenectady. Transferred to San Francisco in 1906 as a salesman, he since has been consecutively manager of the supply department, manager of the San Francisco district office, and since April 1936, manager of a newly created district consisting of California, Arizona and Western Nevada.

RAYMOND L. ALVORD
P. C. E. A.'s new president

He has many interests outside of the electrical industry. He is a past-president of the San Francisco Rotary Club and of the San Francisco Sales Managers' Assn. In 1933 he was chairman of the San Francisco Community Chest campaign. He has been both a director and vice-chairman of the Industrial Committee of the California State Chamber of Commerce. During 1935 he was president of the San Francisco Chamber of Commerce.

Vice-Presidents: P. M. Downing, Pacific Gas & Electric Co.; A. L. Stone, Los Angeles contractor. Treasurer: N. R. Sutherland, Pacific Gas & Electric Co.

Light Sources, Apprenticeship, Distinguish May Meeting

NEW sources of light, both of gaseous types and incandescent, were paraded before the Electric Maintenance Engineers Assn. of Southern California at its May 18 meeting in Los Angeles. Lighting for industrial plants, for commercial establishments, for schools, for homes and for highways was demonstrated, explained, and in many cases shown for the first time. General Electric Co., Incandescent and Vapor Lamp divisions put on the program which ran the complete gamut from infra-red to ultra-violet.

Preceding the lighting show, L. G. Stier, vice principal of Frank Wiggins Trade High School, spoke on behalf of a program of indentured apprenticeship, the details of which are written in another column. He prefaced the program by reviewing the causes for shortage of skilled craftsmen and the present lack of an apprentice-training by which to prepare new craftsmen for the future. Changes of occupation, deaths, retirements have decimated the ranks of skilled mechanics in all lines; no organized training program has been in existence to supply more; during the depression learners were not given the well rounded training necessary to skilled craftsmanship, and admission to labor organizations as journeymen is being asked by many who have devoted the years to their trade but have not learned more than a small part of it; new materials, new processes, new methods have been developed which need increased knowledge. Mr. Stier then urged the cooperation of employer, employee and school groups to set up a definite program and to provide evening training for the units of work not obtained in the routine of work on the job. Endorsement of such a program was given.

Introduced by W. J. Robinson, Jr., district engineer for the G. E. lamp division, the lighting program started with demonstrations of sodium vapor and mercury arc or gaseous conductor light sources. John Shannon, Vapor Lamp Division, reviewed the history of gaseous sources since the first Cooper-Hewitt lamp. He stressed the point that it is necessary to start with the viewpoint which seeks first, "what is it that is to be seen?" Then finding the type of light source that will give the best seeing for that task or object is made simple. In this way the monochromatic or limited color band light sources, such as sodium or mercury vapor, may be selected for their particular characteristics.

Alston Rogers, of the Incandescent Division, carried on with a showing of the new fluorescent lamp, which promises such high output of lumens per watt; the new bi-post 1000-watt lamp; the short necked, medium screw base lamp of 300 watts consumption and 750 hr. life; the higher efficiency coiled coil filament 60-watt lamp; the new low-priced complete photoelectric cell unit designed to control school room lighting; and finally the new flood-flash lamp, shown for the first time on the Pacific Coast. He illustrated the new techniques in the use of light for seeing in offices, schools, industrial plants, stores, and the home. New equipment in reflectors and light control devices were also demonstrated.

Walter E. Coburn, president of the E.M.E.A. called for a vote on the subject for the June 15 meeting. Decision was reached to visit Station B, receiving station for Boulder Dam power, under the auspices of the Bureau of Power and Light.

A stag party is being planned for June 25, at the Veterans of Foreign Wars hall, Slauson and Broadway, Los Angeles, with promise of plenty of entertainment consistent with the occasion.

●

Outlines Indentured Apprenticeship Plan

By E. E. LOMBARD
Chairman, Educational Committee

After careful study the executive committee of the Electrical Maintenance Engineers Assn. of Southern California, has approved the submitting to the membership for consideration of an indentured apprenticeship program. Its purpose is to assist and guide industrial organizations and crafts in establishing a systematic indentured apprenticeship program for electrical maintenance men.

The main points in establishing such a program are as follows:

I. Apprenticeship defined
   1. An apprentice is a person, at least 17 years of age, who has entered into a written agreement with a responsible agency to be employed as a learner, worked as a learner, promoted as a learner, and paid as a learner for a stated number of hours.

II. An apprenticeship program requires:
   1. Advisory Committee whose duties are to determine:
      (a) Number of apprentices to be trained,
      (b) Wage rate at various stages of apprenticeship,
      (c) Provisions for enrolling students,
      (d) Schedule of processes to be learned,
      (e) Type of and cancellation of agreement,
      (f) Practical examination for admission and advancement,
      (g) Certification of results of training, and other matters pertaining to training apprentices.

III. Apprenticeship program consists of:
   1. Selected apprentices in cooperation with parents, and with
   2. Employer organizations,
   3. Employee organizations,
   4. Educational organizations.

IV. Advantages of indentured apprentice training:
   1. Helps to train workmen,
   2. Keeps industry supplied with qualified mechanics,
   3. Creates satisfied customers,
   4. Controlled by public authority,
   5. Enables a better distribution of skilled workers,
   6. Works out a goal for young men,
   7. Regulates a predetermined fair wage,
   8. Encourages more young men to learn a trade,
   9. Offers more opportunity for continuous employment for young men,
   10. Offers a definite learning program,
   11. Keeps the labor market on a more even keel,
   12. Prevents jumping of apprenticeship,
   13. Results in a more careful selection of learners.

V. Sample apprentice training program:
   1. First year—
      800 hours preparatory schooling in a trade school.
   2. Second year—
      1856 hours trade rate in industry,
      144 hours trade school.
   3. Third year—
      1856 hours trade rate in industry,
      144 hours trade school.
   4. Fourth year—
      1856 hours trade rate in industry,
      144 hours trade school.

VI. Employer organizations, employee organizations and educational organizations should all be very greatly interested in a cooperative program of apprentice training. We have been assured of full cooperation by the administrators of the Frank Wiggins Trade School at Los Angeles in this undertaking.

It is urged that the names of your plant engineers and any other persons interested in this problem and who might be willing to serve on committees be given to this committee.

Every member of our association is expected to participate, since we are the sponsors of this pioneering job.

News of the Industry

EDISON TAKES OVER VERNON PLANT

Approval has been granted by the California Railroad Commission to a lease agreement between the Southern California Edison Co. and the City of Vernon whereby the Edison company takes over the operation of the Vernon municipal distribution system and diesel engine plant. Under the terms of the lease the Edison company will pay interest and redemption charges on the bonds issued to build the system together with a 2 per cent levy on the gross less any franchise taxes which might be imposed.

The municipal distribution system will be interconnected with that of the Edison company and power will be supplied from the Edison hydro and steam plants, including Boulder Dam, when the company's line to that plant is completed. The Vernon diesel plant will be operated at frequent intervals to insure that the plant is kept in running order.

The lease is to run for a term of ten years with an option to renew it for a similar interval. It specifies that Vernon rates shall be kept on a parity with those of the Los Angeles Bureau of Power and Light.

BOULDER CONTRACTS BEGIN

Boulder Dam began permanent, routine generation June 1, when all power purchase contracts became effective. Action followed notification to the contractors that the plant was prepared to deliver 1,250,000,000 kw.-hr. of energy per year.

This notice, setting in motion the purchase contracts, will increase revenue by more than 300 per cent, sale of firm power being at the rate of 1.63 mills per kw.-hr. Storage in Lake Mead behind Boulder Dam approximates 17,000,000 acre-ft. with head near 470 ft. Minimum head for continual delivery is 420 ft.

Agencies to whom notices were issued are the Department of Water & Power of the City of Los Angeles, the cities of Burbank, Glendale, and Pasadena.

BOULDER DAM POWER was carried to another district last month when the Pioche power line, being built for the Lincoln County Power district, was completed. The 69-kv. line will energize an extensive mining district.

THE PUBLIC UTILITIES COMMITTEE in the Assembly of the California State Legislature last month recommended against appropriating $10,000 to investigate California power companies. The resolution was tabled after Thomas M. Carlson, attorney for the State Water Authority, opposed it. He said that the companies are cooperating with the authority, which wished to put no obstacles in the way of its Central Valleys Project.

SAVE SPACE

First transaction for exhibit space at the Golden Gate International Exposition in 1939 was made last month when James B. Black (right), president of the Pacific Gas & Electric Company, and member of the Exposition Board of Management, received a check for $32,000 from W. R. Marshall (left) San Francisco, vice-president of the Westinghouse Electric & Manufacturing Company. Miss Theodora Coleman looks on. The agreement gives Westinghouse 5,000 square feet of space in the Palace of Electricity

COURT UPHOLDS PWA

Actions brought in District of Columbia courts by two utility companies* seeking to enjoin PWA allotments for power construction in a number of municipalities were dismissed May 10. The decision did not take up the question of PWA's constitutionality, but confined itself to charges of unlawful competition. It was held that neither company held exclusive franchises; therefore, that the prospective competition was not unlawful. Quoting the opinion:

"The fact that, in furnishing the funds which will enable the municipalities to engage in such competition, the Administrator may have exceeded his authority, or may have acted under an unconstitutional statute, does not affect the situation. The thing which affects the plaintiffs is the competition, and that is lawful."

The decision places these cases in line for consideration by the United States Supreme Court early next fall as a test case upon which will depend the fate of over 50 similar PWA allotments on which litigation is now pending.

* Alabama Power Co. and Iowa City Light & Power Co. in the District of Columbia Court of Appeals. Municipalities concerned are Decatur, Sheffield, Tuscumbia, Guntersville, Hartselle, and Russellville, Alabama, and Iowa City, Iowa.

POWER RATES GO DOWN

Southern California Edison Co. customers will save $695,000 annually as the result of rate reductions announced late last month by the California State Railroad Commission. Of the savings, more than $400,000 will be enjoyed by domestic consumers, the balance by commercial. The reduction, which exceeds the $550,000 originally contemplated, is in line with Edison policy of establishing uniformity of rates throughout its territory.

A REDUCTION IN RATES for both services of the Coast Counties Gas & Electric Co., Calif., will save customers $120,000 annually. Scheduled to be effective June 1, the proportion of reduction in gas and electric services was being determined by the California State Railroad Commission.

FPC SCORES LEGISLATION

Pending bills for the disposition of power from the Bonneville development were censured for failure to provide clear-cut rate control, in a report filed by the Federal Power Commission with the House Rivers and Harbors Committee. The pending bills place responsibility for rate fixing in an Administrator subject to review by the Commission, which in effect gives the latter the power to veto but not to change. Characterizing this as "an impossible position," the commission stated:

"The Federal Power Commission does not desire to be understood as urging that jurisdiction over rates to be charged for electric energy generated at the Bonneville project be vested in it, but does recommend that it either be relieved from any responsibility in connection with rates charged or that its control over rates be made adequate, effective and complete if, in the opinion of Congress, it should be charged with this responsibility."

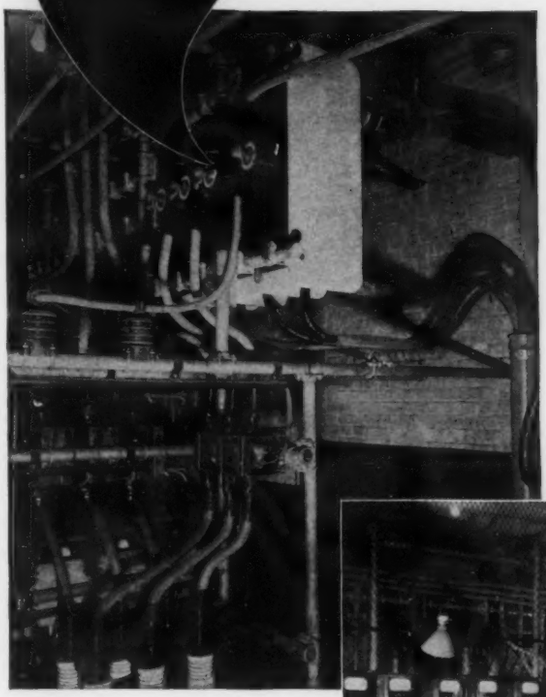
3 YEARS ... not a leak!

HARVEL OIL STOP

THE cable insulating material that does what its name implies

- - - it stops oil leaks

Before Oil Stop cable insulating material was installed, it was necessary to clean up and reinsulate cables about every 3 months. A very costly job.



Three years of uninterrupted service with Harvel Oil Stop cable insulating material.

OIL STOP IS

MOISTURE PROOF • HEAT RESISTING
SLOW BURNING • OIL PROOF
ACID AND ALKALI PROOF

OIL STOP APPLICATIONS

Stop joints on oil impregnated paper insulated power cables.

Terminal seals on oil impregnated paper insulated power cables.

Water tight seals on rubber insulated cables.

Oil tight seal in connecting rubber insulated cables to paper insulated cables.

WRITE FOR OIL STOP BULLETIN

STANDARD OF THE WORLD
IRVINGTON INSULATION
TRADE MARK

Manufactured under **HARVEL PATENT LICENSES** *by*

IRVINGTON VARNISH & INSULATOR CO.

IRVINGTON, NEW JERSEY, U.S.A. *Est.* **1905**

VARNISHED CAMBRIC • VARNISHED CAMBRIC TAPES • IRV-O-SLOT • VARNISHED CANVAS
VARNISHED SILK • FLEXIBLE VARNISHED TUBING • VARNISHES AND COMPOUNDS

There's Profit In Private Telephones

Your customers that need quick interior communication—and practically all of them do—will find no finer private telephones than these handsome modern handsets, made by one of the oldest and largest manufacturers of public telephone exchange equipment.

AUTOMATIC ELECTRIC INTERCOM SYSTEMS

Are supplied in capacities of 2, 6, 10 and 11 stations with wall or desk type telephones. Being easy to install, simple to operate and good to look at, they will find a ready market in your territory. Write for catalog and discounts.

[AUTOMATIC ELECTRIC intercom systems are designed for private service. They cannot be connected with the public telephone system.]

American Automatic Electric Sales Company

1033 West Van Buren St., Chicago

Los Angeles Office: 555 S. Flower St. **San Francisco Office:** 325 Ninth St.

Nev-Cal Corp. Submits Plan For Imperial Development

Protection of public interest and assurance of lowest rates is the purpose of a plan submitted by the Nevada-California Electric Corp., through President A. B. West to the directors of the Imperial Irrigation district, concerning power projects incident to construction of the All-American Canal. Involved is a loan of $2,766,000 for hydro-plant development along the canal, of which 70 per cent is said to be ear-marked for distribution and standby facilities. These will duplicate those of the Nevada-California company.

The corporation's ultimate plan suggests instead of spending 30 per cent of the total figure for 9,250 kw. of generating capacity, 33,760 kw. be installed initially in four plants located along the entire development.

Power for district use in desilting, dredging, pumping and drainage would be delivered to the point of use for transmission cost only as might be fixed by the California Railroad Commission. Power in excess of district requirements, the corporation would agree to purchase over a period of 40 years at 5 mills per kw.-hr. delivered at high tension bus of the plant's substation. In addition, the utility would spend $700,000 for rural electrification of the Imperial Valley within twelve months following the granting to it, without cost, of the necessary rights-of-way. As an alternative, the district could elect to have the utility apply for a $700,000 loan and construct such additional rural lines as an REA project.

Future rates in the valley would be based on the cost of electricity purchased from All-American canal plants with no consideration for cost of power from other sources except for standby purposes, or to the extent that it is required to supplement that so purchased. The standby-power cost, as included in the rates, will not exceed the cost of equivalent standbys from adequate diesel generating plants located in the valley.

Based on the waterflow shown by Bureau of Reclamation estimates, the All-American canal power plants, described above, would show an aggregate net earning of some $28,000,000 over a 40 year period, after taking care of power cost, including operation, depreciation, interest, and amortization of the power loan from the PWA. This amount would more than meet the entire cost of construction of the All-American canal and the funds thus provided would be available to meet all canal payments as they fell due. Thus customers would obtain the benefit of low rates, would be able to pay all operating costs, amortize their indebtedness to the government for construction of the entire project, and would be assured of high grade service.

In his proposal, Mr. West said, "We ask that the people in the valley be given an opportunity, before final decision is made, to vote directly upon the question as to whether they prefer to accept the corporation's proposal, or to proceed with the present competitive program. The issue at stake is too large and too vitally essential to the future of the valley to be decided without impartial investigation, and the opportunity of all residents in the valley to record their wishes." Inasmuch as the Imperial Valley already is a highly electrified area, duplication and competition can only result in losses to both organizations and higher rates for the customers.

●

New Rocky Mountain Leagues Being Founded

Strength of the new Rocky Mountain Electrical League rests largely on a decentralized organization, with local leagues as key units. All electrical interests in the region are being rapidly bound together with the formation of a chain of these local groups, several of which already are functioning. Among the new groups and their officers are:

Pueblo—Fred H. Voss, D. Z. Phillips Music Co., president; E. C. Alexander, Southern Colorado Power Co., secretary.

Albuquerque—Bernie May, May Music Co., president; H. L. Pinkerton, Albuquerque Gas & Electric Co., secretary.

Carlsbad—W. E. Smith, Pratt-Smith Hardware Co., president; J. D. Smith, Southwestern Public Service Co., secretary.

Santa Fe—T. K. Broome, Broome Furniture Co., president; J. E. Flynn, New Mexico Power Co., secretary.

Roswell—Paul Wilmott, Mabie Lowery Hardware Corp., president; W. D. Knight, Southwestern Public Service Co., secretary.

●

CONTRACTS for two large oil circuit breakers and lightning arrester equipment for Boulder Dam Power house, were awarded recently to the Westinghouse Electric & Manufacturing Company on a bid of $108,280.99. The circuit breakers are rated 230 kv., 1,200 amp., and the lightning arrester 230 kv., 3-phase outdoor type. They will be used with units N-5 and N-6 in the Nevada wing of the powerhouse, and will be placed in operation next year.

●

SEALED BIDS for two 82,500 kva., 150-180 r.p.m., vertical generators for the Boulder plant will be received by the U. S. Bureau of Reclamation until 2 p.m., June 14.

"The city's power hasn't been off in 10 years _ we can't fail now!

*"We've got a reputation to maintain here! I'm not going to let sticking piston rings in my Diesels spoil a record of 10 years' perfect performance!"

How Shell men kept Slater's Diesels humming ... her lights shining!

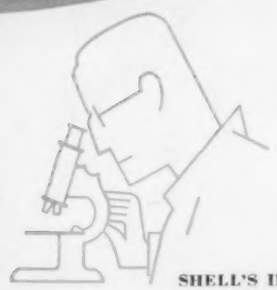
THE fine record of the power plant at Slater, Mo., was threatened! Could the record be saved?

Shell Engineers made a complete plant survey. Diesels were dismantled. The answer to sticking rings and piston seizures was revealed in the excess deposits in the ring grooves.

Then, the proper Shell Lubricant, designed to meet the particular operating conditions of these Diesels, was applied. Performance proved the point! Today Slater's Diesels are completely Shell lubricated!

Shell men were able to meet Slater's needs for the same reasons they are solving the tough operating problems of industry all over the world. Shell's ingenuity and resourcefulness are available for solving your problems . . . or increasing your plant's efficiency. Address your nearest Shell Office: Industrial Lubricants Division, Shell Building, San Francisco; or Shell Building, St. Louis; or 50 West 50th St., New York.

*An actual case history from Shell's files.



SHELL'S INVISIBLE ELEMENT is a combination of Shell's unmatched world-wide resources; Shell's modern laboratories and refineries; years of cumulative experience in research by Shell's engineers and scientists. It is the determination to make lubrication more efficient, more economical for you.

SHELL

SHELL INDUSTRIAL LUBRICANTS

No. 201 N. E. Klein Side Cutting Plier. "Streamlined" for use in confined spaces.

Good workmen demand good tools. In the hands of men who know — everywhere — the pliers are invariably Kleins. Only the keen, hand-honed, perfectly matched cutting knives of Klein Pliers — only the comfortable spring grip in the Klein handles — only the general all around quality that is an inherent part of every Klein Plier can satisfy men whose work demands the best in tools. This, perhaps, explains why Klein Pliers are the standard of quality by which others are judged — why the name Klein has stood for maximum quality, "since 1857."

DISTRIBUTED THROUGH JOBBERS

Foreign Distributor: International Standard Electric Corp., New York

---

The four pamphlets listed below will be sent without charge to anyone interested. Check the ones you want:

- ☐ Safety for the Pole Climber.
- ☐ Specifications on Linemen's Belts and Safety Straps.
- ☐ The Safety Factor on Linemen's Leather Goods.
- ☐ Pocket Tool Guide.

Mathias KLEIN & Sons
Established 1857 — Chicago, Ill. U.S.A.
3200 BELMONT AVENUE

Waters Impound Behind Boulder Dam

Approximately 9,500,000 acre-ft. of water will flow into Lake Mead from the Colorado River watershed before the end of July, according to estimates based upon eighty separate snow survey courses, S. O. Harper, acting chief engineer of the Reclamation Bureau has announced. Present information on snow conditions indicates spring flood run-offs from the principal tributaries of the river as follows:

Colorado River at Palisade, Colo., 2,000,000 acre-ft.

Gunnison River watershed, 1,500,000 acre-ft.

Green River (Wyoming), 1,100,000 acre-ft.

Green River (Utah tributaries), 1,000,000 acre-ft.

White and Yampa Rivers, 1,400,000 acre-ft.

San Juan and Dolores Rivers, 2,500,000 acre-ft.

With the present storage content of 11,000,000 acre-ft., it is expected that Lake Mead will contain 17,000,000 acre-ft. by the end of July after allowance for required downstream irrigation and power requirements. Normal inflow will hold the lake at that level throughout the balance of 1937.

CALIFORNIA STREAMS will show little departure from the flow forecast in April, it was reported last month by the State Department of Public Works, after a complete tabulation of data from temperature and precipitation stations. Only changes from the earlier prediction are slight reduction in total precipitation for the southern part of the state. This figure in the Kings, Kaweah, and the Kern reduces from 160 per cent to 155 per cent, and on the basis of partial returns in Los Angeles, San Diego, and Santa Ana basins, changes from 160, 165, and 180 per cent respectively to 140, 150, and 165 per cent respectively.

●

LOW RATES, aimed to encourage better street lighting in rural communities, were filed at Olympia, Wash., last month by the Puget Sound Power & Light Co. Reduction on large size street lights exceeds 30 per cent, and includes provision for installing most modern equipment. Under the new rates, municipalities may obtain three times the illumination for 30 per cent less cost.

●

ADVERTISING of the Utah Power & Light Co. recently was awarded second place in a survey of ads of 99 utilities throughout the nation in the rating made by a publication called *Public Utility Ad News,* Niagara Hudson Power Co. had first place.

TWELVE IRRIGATION DISTRICTS in Idaho along the Snake River have protested to R. W. Faris, Idaho state reclamation commissioner, against the application of the city of Idaho Falls to appropriate 1,000 sec. ft. of water for power purposes. The districts said the power dam would be located in the so called "losing section" of the Snake, and that water impounded would be lost through the soil. This, it is claimed, will materially reduce the quantity of water in the river.

●

Ruby Dam Foundations To Be Started

Ruby dam, to store water on the Skagit river for use in hydroelectric plants owned by the city of Seattle, will be started soon. Funds now available total $4,500,000, of which PWA supplies 45 per cent and the city, through bonds already sold, 55 per cent.

Bids will be invited this month for the first step, including excavation of foundations and placing 300,000 cu.-yd. concrete from elevation 1,150 to about 1,300. Later, elevation will be raised to 1,500 and 1,725, the ultimate crest.

Seattle's board of public works last month awarded a $1,124.297 contract to the A. S. Schulman Electric Co. of Chicago to construct 560 steel transmission towers along a 116-mile line between Newhalem on the Skagit river and Seattle.

●

West Kootenay Co. To Build Hydro Plant

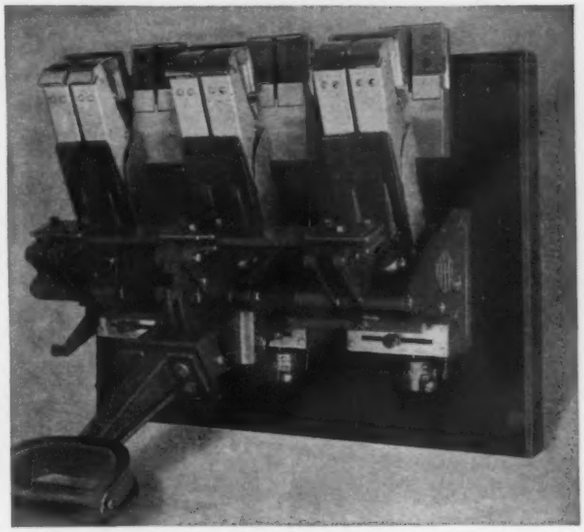
Expenditure of more than $4,000,000 on a fifth hydro-electric plant, probably at Castlegar, B. C., on the Kootenay River, is foreseen in the recent announcement of Lorne A. Campbell, vice-president and general manager of the West Kootenay Power & Light Co., contained in the annual report of the Consolidated Mining & Smelting Co.

It is understood plans for the new plant are being rushed to completion as a result of extreme water shortage last winter and subsequent restriction of power service to the Tadanac smelting and reduction plants, the gold camps of Sheep Creek area, and other services.

The site is just north of Castlegar, in the Kootenay River gorge, just before the river spreads into the Columbia River Valley. It is twenty miles west of Nelson and several miles below the present South Slocan plant.

It is understood that the Canadian Pacific Railway will be relocated on higher ground, the new reservoir extending up-river nearly to the South Slocan unit, and that the new plant will be similar to the Corra Linn plant, which consists of three 18,000-hp. vertical units.

AIR CIRCUIT BREAKERS

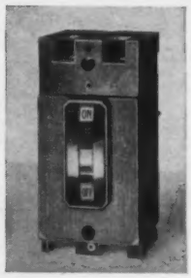


I-T-E Circuit Breakers of the carbon break type are listed as standard in capacities ranging from 2 to 10000 amperes and for use on voltages up to and including 750 volts. Special circuit breakers have been manufactured with capacities up to 54000 amperes at 750 volts, direct current.

Remote control circuit breakers operated by solenoid or motor are available in all capacities. I-T-E also manufactures a complete line of hand and remote control transfer switches and field switches, as well as laminated toggle switches.

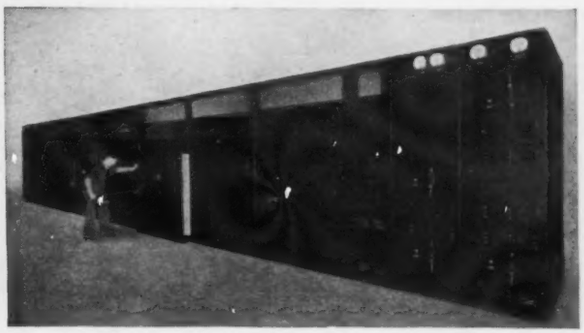
Special problems in electrical protection are given immediate attention by our engineers.

ITELITE CIRCUIT BREAKERS OF THE THERMAL TYPE



ITELITE circuit breakers are thermally operated breakers designed to eliminate fuse replacement in protecting power and lighting circuits. They are available in capacities suitable for the protection of all commercial wire sizes from 15 to 600 amperes and for voltages up to 250 volts direct current and 600 volts alternating current.

The ITELITE line includes single, double and three pole circuit breakers suitable for mounting in lighting panelboards, in convertible power panels, in load centers, on switchboards or in special enclosures for industrial purposes.



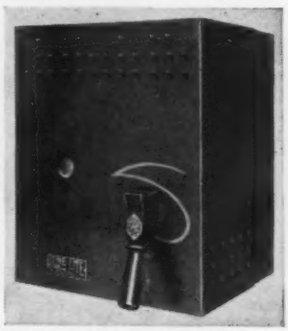
MULTUMITE SWITCHBOARDS

Multumites are self-supporting steel enclosed switchboards—every live part including buses, enclosed in steel—of the most modern construction. Circuit breakers are mounted rigidly in position or on pantograph arms for easy disconnection and removal. Large circuit breakers can be mounted in removable trucks and incorporated in multumite units.

Multumite switchboards protect and control circuits from 2 to 4000 amperes up to 600 volts, alternating current and 2 to 10000 amperes at 750 volts direct current.

U-RE-LITE CIRCUIT BREAKERS

U-Re-Lites are steel enclosed air circuit breakers, especially adapted to the protection of motors and motor circuits. U-Re-Lite capacities range from 2 to 1600 amperes at 250 volts D. C. and up to 600 volts A. C. Standard U-Re-Lite boxes provide for all usual methods of mounting and connection. Special boxes can be furnished to make U-Re-Lites dust-proof and moisture-proof.



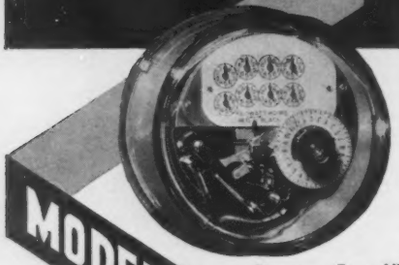
Type KJB, KSB and KWB Circuit Breakers are compact solenoid operated air circuit breakers in steel enclosures. These circuit breakers are available in single and multiple pole types with capacities of 2 to 800 amperes, 250 volts, D. C. or up to 600 volts A. C.

Descriptive literature and quotations on all I-T-E devices can be obtained from representatives listed below or from the I-T-E factory

San Francisco, Cal. . . . 74 New Montgomery St. . . . Oliver B. Lyman — E. S. Moreland
Los Angeles, California . . . . . 106 W. Third Street . . . . . Otto Demmert
Denver, Colorado . . . . . 1921 Blake Street . . . . . Howard Peterson
Seattle, Washington . . . . . 602 33rd Avenue . . . . . Burton R. Stare
Vancouver, British Columbia . . . 622 Metropolitan Building . . . N. D. Blagdon Phillips

I-T-E CIRCUIT BREAKER CO. • PHILADELPHIA

METER
and
CONTROL
Off-peak Loads
with



MODERN METERS

Sangamo Type HV-S-2
Two-rate Meter, Socket
Mounting

Sangamo Type HV-A
Meter and Time-Switch
In "A" Base

For MODERN LOADS

Western
Offices:
LOS ANGELES
326 Subway Term. Bldg.
SEATTLE
220 Ninth Ave. N.
PHOENIX
1318 W. Lynwood St.
SAN FRANCISCO
1061 Howard St.
DENVER
1526 Blake St.

SANGAMO
ELECTRIC
COMPANY
SPRINGFIELD, ILLINOIS

SELLING SUMMARY

Following are newsworthy events in western merchandising. Scope and methods of the most successful will be given complete coverage in our next issue.

CONTRA COSTA COUNTY Electrical Dealers collaborated with the Pacific Gas & Electric Co. to stage an electrical exposition and cookery demonstration in the Masonic Temple at Concord under the direction of Abbie V. Farnsworth, May 13 and 14. Door gifts included an electric range and water heater.

●

THE AIR CONDITIONING SOCIETY in San Francisco last month met jointly with the Heating and Piping Contractors Assn. to hear William E. Leland, consulting mechanical engineer, on "Heating Problems in Air Conditioning".

●

FOUR-HUNDRED DEALERS in territory served by the Utah Power and Light Co. last month joined in a "Buy What You Sell" campaign. Purpose: to sell water heaters to 1,200 dealer employees, 1,700 utility employees. Early returns included 8 sales in a group of 28 employees. The program may extend to other appliances upon termination of the water heater drive.

●

SO TIMELY was the "Spring Fair" idea in San Diego County that all exhibit space was taken well in advance of opening, May 22. Widespread, effective advertising and publicity preceded the successful 4-day event.

●

RUNNING WATER systems are receiving concentrated attention of field representatives of the Utah Power & Light Co., who are securing prospects, turning names over to dealers. Simultaneously, a direct mail promotion piece, "Life in the Country", goes to 4,000 prospects. Group meetings between pump dealers and representatives of the company are going forward under direction of K. W. Browning, in charge of farm electrification.

●

WASHINGTON WATER POWER CO. terminated a six-months "Better Light-Better Sight" campaign with 11,102 I.E.S. lamps sold. Of the total, dealers sold 6,364. Highest award went to J. D. Lewis for the 247-per-cent-of-quota rating of the Palouse Division.

●

STEP-SAVING, all electric kitchen installations have exceeded 100 during 2-months operation of the kitchen planning service of the Washington Water Power Co.

●

MORE THAN 100 electric cooking schools are scheduled in a program under way by the Washington Water Power Co. The company's enlarged staff of home service advisers are cooperating with dealers.

●

A $12,500,000 APPROPRIATION for California's Central Valleys Project was included in the interior department money bill reported to the U. S. House of Representatives last month. The figure was a $2,500,000 reduction over the estimate submitted in the budget. In reporting the measure, the House Committee said that no delay will result from the decrease in funds made available at this time. Pointing out the need for immediate action on supplementing water supplies, the committee made no reference to the power phases of the project.

CHICAGO HOTELS were crowded June 1 to 4 with many hundred important members of the electrical industry who assembled for the annual convention of Edison Electric Institute at Palmer House.

●

Supreme Court May Review TVA Injunction Dismissal

Although the May 14 decision of the Sixth U. S. Circuit Court of Appeals in the suit of 17 southeastern utility companies against the Tennessee Valley Authority resulted in a dismissal of the injunction prohibiting further expansion of TVA's power activities, the Authority has asked the U. S. Supreme Court to review that part of the verdict remanding the case to the U. S. District Court of Judge John J. Gore for trial on its merits. James Lawrence Fly, TVA solicitor, filed the petition for review on May 20, and requested that the Supreme Court indicate before its adjournment on June 1 whether or not it would entertain the review next fall.

An affirmative answer, according to Mr. Fly, would permit TVA to proceed with construction without danger of further interference by the lower courts. It is the government's contention that the present suit raises no issues not already settled by the Supreme Court in its decision of February 7, 1936, in the Ashwander case.

●

Big Electrification Project Planned for Idaho

Idaho reclamation officials are drawing plans for an $8,000,000 rural electrification and supplementary irrigation project in eastern Idaho which they claim would embrace 500,000 acres of land and assist 70,000 persons. State Commissioner R. W. Faris has presented the project to the U. S. Bureau of Reclamation.

Funds will be obtained from the government on a repayment plan if the bureau of reclamation gives approval. The plan is to divert water from Yellowstone Lake through a tunnel to a dam which would be constructed at the narrows on the Snake river, just across the Idaho line in Wyoming. The dam would store 200 acre-ft. of water for a hydro plant in addition to 300,000 acre-ft. for reclamation.

●

MANY REPRESENTATIVES of utility engineering departments will be in Chicago, Oct. 4 to 9, for Chicago's Exposition of Power and Mechanical Engineering. Details are available from exposition offices at Grand Central Palace, New York.

The SQUARE D MULTI-BREAKER

Does Build Wiring Business for the Contractor . . .

Here's PROOF!

■ That alert contractors have made extra profit through the sale of the Square D Multi-breakeR has been proved—and is being proved daily.

The houses illustrated above are all equipped with Square D Multi-breakeRs.

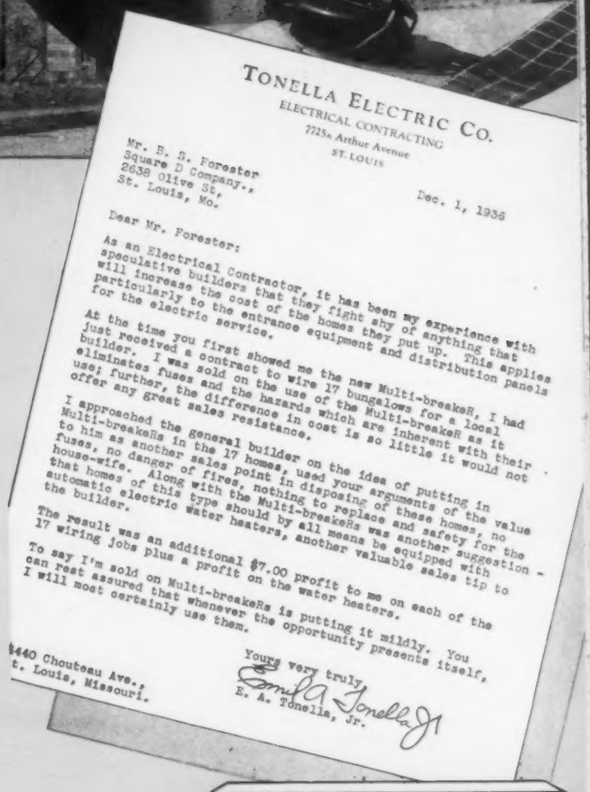
The letter, reproduced herewith, is evidence that the Square D Multi-breakeR was the means whereby this contractor made extra profit.

Square D has sold the idea of fuseless circuit protection at a low cost through merchandising the Square D Multi-breakeR—and you can realize on this merchandising.

With this new device, plus the ready market which exists because of the housing shortage, you can sell the idea of "full comfort" wiring at a greatly increased volume of profit for yourself. It is being done and you, too, can do it.

Use the Square D Multi-breakeR to introduce the "full comfort" wiring idea and get the extra profit it makes possible.

Square D electrical devices are available through electrical wholesalers everywhere



TONELLA ELECTRIC CO.
ELECTRICAL CONTRACTING
7725a Arthur Avenue
ST. LOUIS

Mr. B. S. Forester
Square D Company.,
2638 Olive St,
St. Louis, Mo.

Dec. 1, 1936

Dear Mr. Forester:

As an Electrical Contractor, it has been my experience with speculative builders that they fight shy of anything that will increase the cost of the homes they put up. This applies particularly to the entrance equipment and distribution panels for the electric service.

At the time you first showed me the new Multi-breakeR, I had just received a contract to wire 17 bungalows for a local builder. I was sold on the use of the Multi-breakeR as it eliminates fuses and the hazards which are inherent with their use; further, the difference in cost is so little it would not offer any great sales resistance.

I approached the general builder on the idea of putting in Multi-breakeRs in the 17 homes, used your arguments of the value to him as another sales point in disposing of these homes; no fuses, no danger of fires, nothing to replace and safety for the house-wife. Along with the Multi-breakeRs was another suggestion - that homes of this type should by all means be equipped with automatic electric water heaters, another valuable sales tip to the builder.

The result was an additional $7.00 profit to me on each of the 17 wiring jobs plus a profit on the water heaters.

To say I'm sold on Multi-breakeRs is putting it mildly. You can rest assured that whenever the opportunity presents itself, I will most certainly use them.

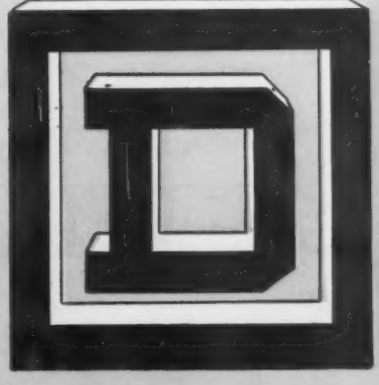
Yours very truly,
Tonella Tonella Jr
E. A. Tonella, Jr.

8440 Chouteau Ave.,
St. Louis, Missouri.

SQUARE D COMPANY

LOS ANGELES - DETROIT - MILWAUKEE
SQUARE D COMPANY CANADA LTD. TORONTO, ONTARIO

CALL IN A SQUARE D MAN



Portland Utilities Under Unified Management

The West Coast Power Co., California Public Service Co., and Western States Utilities Co., all with headquarters in Portland, Ore., are now under supervision of Stone & Webster Service Corp. Scheduled for 1937 is a $409,000 program for rehabilitation of present facilities and new extensions in the 25 localities served by these companies in Oregon, Washington, Idaho, California, Utah and Nevada.

M. V. Watson, for many years vice president of all three companies, retains this position. F. G. Barnett and W. C. MacInnes have been appointed operating managers with responsibilities divided territorially rather than by companies.

C. A. Comstock, a long time member of the West Coast organization, has been made sales manager for the three companies and is carrying forward an aggressive program.

●

A BILL PROVIDING $25,000 to survey a hydro-electric site at Cabinet Gorge on Clark Fork of Columbia River was approved last month by the U. S. Senate.

ELPEco
ELECTRIC POWER EQUIPMENT CORPORATION
412-420 NORTH 18TH STREET
PHILADELPHIA, PA.
The call today is for high quality switching equipment . . . . not only for new construction, but to supplement many make-shifts that increased loading now makes hazardous.
. . . . . ELPECO MAKES NO SECOND CHOICE EQUIPMENT
WESTERN AGENTS
LOS ANGELES
L. W. Thompson
912 East 3rd St.
SAN FRANCISCO
C. E. Ingalls
Rialto Bldg.
SEATTLE
J. C. McDougall
2207 First Ave. S.
DENVER
R. F. Hamilton
Gas & Electric Bldg.
OKLAHOMA CITY
Paul Berry
3128 N. W. 26th St.

Rocky Mountain League In Gift Month Promotion

Under sponsorship of the newly-formed Rocky Mountain Electrical League, which is collaborating with the Edison Electric Institute in promoting "Electrical Gift Month," scores of dealers and distributors are getting June wedding business in the Rocky Mountain area. The campaign is particularly vigorous in localities where local league chapters have been formed.

Incorporated in the program is the idea of electrical gifts for June wedding anniversaries, as well as marriages. The League is supporting the idea that one anniversary might well be made the occasion for electrical gifts.

Newspaper, radio, poster and other advertising media are being supplemented by various novel promotional ideas. Public weddings, as features of appliance shows, with the principals receiving electrical gifts as rewards for their participation, are being arranged in several localities.

The Denver branch of the League arranged a bridal reception and electrical gift shower. Miss Bernadine Willson, wearing the gown in which she will be married in June, was the hostess. Miss Willson is a member of the staff of the Electric Institute of the Public Service Co. of Colorado. Club women and others, who daily visit the Institute by the score, were given a glimpse of the beautiful and useful electrical devices without which no newlywed's home is complete.

Hundreds of the official "Electrical Gift Month" posters are being displayed by the merchants of Colorado, New Mexico, Wyoming and several adjacent states in which there are affiliates of the League. Ranges, refrigerators and other major appliances are being featured, as well as the smaller items.

●

THE FEDERAL POWER COMMISSION has issued a denial of what it terms misleading statements concerning the election of a new vice-chairman. The Commission states that Manly voluntarily relinquished vice-chairmanship, that Commissioner Seavey was unanimously elected at a regular meeting.

●

TO DEMONSTRATE the baking and broiling ovens on electric ranges, Westinghouse Electric & Manufacturing Co. has devised inexpensive metal racks holding Lumiline lamps which can be inserted easily in place of the heating element. Through the use of this demonstrator the housewife is able to see just what happens in an oven when different temperature settings are made.

Refrigeration Engineers

We are pleased to announce the consummation of an agreement whereby the sales and service facilities of this company are now available for products of the

CARBONDALE DIVISION of

WORTHINGTON PUMP & MACHINERY CORP.

throughout the state of California and portions of Nevada and Arizona. This new and complete service is offered in ice making or pre-cooling installations for cold storage plants, breweries, wineries, dairies, ice cream plants and other industries utilizing refrigeration processes.

Complete plans and specifications will be submitted by Pelton refrigeration engineers. Literature is immediately available and will be forwarded upon request.

THE PELTON WATER WHEEL COMPANY

HYDRAULIC ENGINEERS

120 Broadway
New York

2929 Nineteenth Street
San Francisco

Paschall Station
Philadelphia

Exclusive Western Representatives for Baldwin-Southwark Corp., De La Vergne Engine Co., Cramp Brass & Iron Foundries Co., Woodward Governor Co., and Automatic Valve Division, Chapman Valve Manufacturing Co.

PELTON

THE BEST PLAN executed by a utility during 1937 for the development of domestic electric water heating load will receive $1,000 in cash and a silver trophy, according to an announcement of the National Electric Water Heating Council. The announcement is contained in a plan book being distributed nationally to utilities. It is the first step in a cooperative effort of manufacturers to build public acceptance. The award will be made for most originality and most effective execution. Kinsey M. Robertson, president of Idaho Power Company, is chairman of the National Electric Water Heater Council which is sponsored by the Edison Electric Institute and National Electrical Manufacturers Association.

Western members of the Water Heating Council representing utilities are: H. M. Crawford, Pacific Gas & Electric Co.; T. D. Fulford, Puget Sound Power & Light Co.; C. W. Milliken, Southern Colorado Power Co., and H. A. Walsh, El Paso Electric Co.

●

FOR ITS SECOND MACHINE TOOL electrification forum, Westinghouse Electric and Manufacturing Co. published a sizeable loose-leaf notebook on motor applications in machining processes. Interwoven are technical papers by company engineers and those in various manufacturing industries, together with appropriate motor bulletins.

●

ELECTRIC WASHER MANUFACTURING facilities of the General Electric Co. were increased last month, when the Home Laundry Equipment plant moved into new quarters at Bridgeport, Conn. Premises with 30 per cent more floor-space were purchased from the Remington Arms Co.

Six G-E single-phase station-type induction regulators, 48 kva, 2400 volts. Installed at the Dallas Substation of the El Paso Electric Company

Your Customer Also Benefits

from Correct Voltage at the Entrance Switch

CUSTOMERS of the El Paso Electric Company are getting the maximum return on each dollar invested in light, heat, and power—because full-bodied volts are coming over the feeders regulated by these G-E equipments. This is also important to the Company because it knows that good service of this kind keeps existing appliances on the line and encourages the use of new ones.

Regulation with G-E equipment will benefit you just as it benefits the El Paso Electric Co. First, revenue which might otherwise be lost is recorded on the meters; second, load growth is encouraged.

Regulation is a profitable investment anyway you figure it. Furthermore, the complete line of G-E regulators makes it possible to regulate the system economically at any point and for any load density. Ask for our portfolio "The 8 Point Plan for Profitable Voltage Regulation." (GES-1142A). General Electric, Schenectady, N. Y.

350-135D

GENERAL ELECTRIC

I.E.S. President Regar Visits Western Chapters

"The goal of illuminating engineers will have been reached when, as a result of the concomitant development of its component elements, every lighting-installation design will be efficient, effective, artistic; will produce an illumination correct in quantity and quality, properly balanced as to high-light and shadow, restful to the eye and harmonious with the color scheme, and will appeal to a highly developed sense of beauty."

Such was the ideal of illuminating engineering as set forth to the San Francisco Bay Cities Chapter, Illuminating

I. E. S. president Bertram Regar speaks to the San Francisco chapter. Seated are (left) Dr. Leland Brown, Stanford University; (right) Gilbert Trosper, chapter president

Engineering Society, at its May 11 meeting, by Bertram Regar, president of the I. E. S.

On the first tour of an I. E. S. president to the Pacific Coast, Mr. Regar deplored the distance between the two oceans as responsible for a lack of understanding between West and East. Conference during his western trip, he said, has eliminated much misunderstanding.

Rapid progress in the science of lighting, he said, is a challenge to lighting men to keep pace. Close organization, such as the I. E. S., he cited as a means.

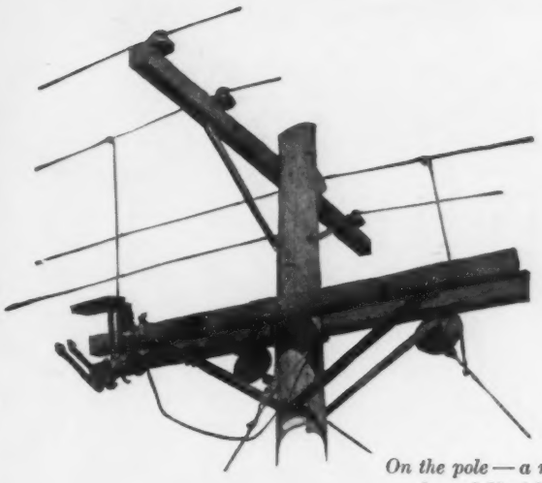
Outstanding accomplishment of I.E.S. study and reading lamps, the important studies of the committee on industrial lighting, the issuance of lighting data sheets and the exhaustive study and dissemination of the society's findings in the relation of light to sight and to safety, are among contributions made by the Society to industry and human welfare. Its professional, impartial position make it a natural medium for the dissemination of information to other professional bodies. Commercial interests would encounter difficulty in this task, he said.

Mr. Regar strongly urged chapters to undertake active programs in their own communities. Mr. Regar's trip through the west took him first to Los Angeles, then San Francisco, Portland and Spokane. He addressed the I. E. S. section or chapter and industry meetings.

THERE ARE

Operating Advantages

BUILT INTO THE MECHANISMS OF



On the pole — a neat, dependable job.

The TRIP-SAVER RECLOSING SWITCH

Consider these

FEATURES OF RECLOSING SWITCHES

DEAD END RING — permits the riser wire to be attached directly to switch. A Kearney Con-Nec-Tite makes the terminal connection. Cast Bronze Hood — protects upper contact mechanism against weather.

●

POINT PRESSURE CONTACTS—give positive current transfer without excessive heating and make direct contact with fuse link.

●

CLAMP-TYPE HANGER—surrounds crossarm and is adjustable to standard sizes of crossarms.

●

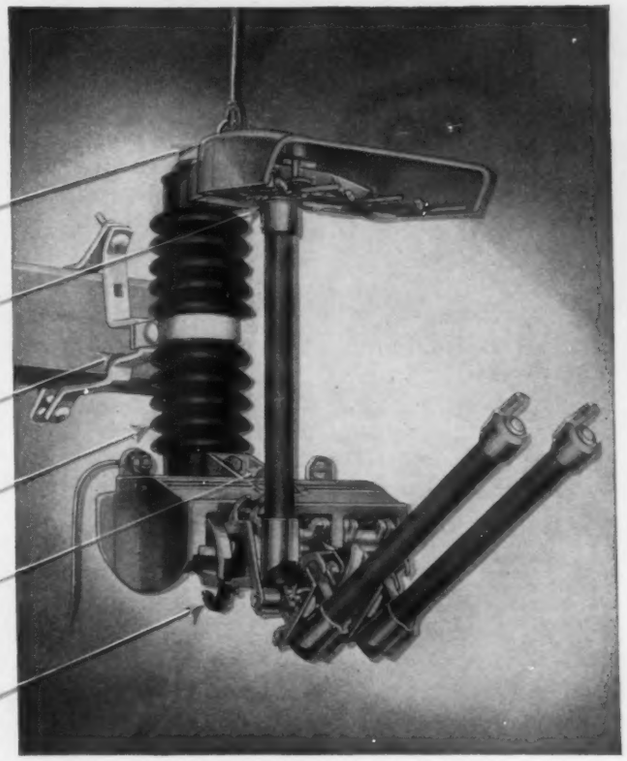
TUBULAR INSULATOR — made of extruded wet process porcelain.

●

KEARNITE FUSE TUBE — is composed of an inner layer of tough horn fibre and an outer layer of rolled bakelite.

●

LOWER OPERATING MECHANISM—is completely housed in cast bronze housing. Kearney Con-Nec-Tite used for lower line terminal connection.



TYPE D TRIP-SAVERS

These switches are made 5000 to 34,500 V., 100 Amp., and available in two or three cartridges.

SOLDERLESS CON-NEC-TITES;
T-CON-NEC-TITES;
LAP-TITE CONNECTORS;
TRIP OUT FUSE SWITCHES;
TRIP-O-LINK FUSE SWITCHES;
TRIP-SAVER FUSE SWITCHES;
ONE AND TWO INSULATOR FUSE AND DISCONNECT SWITCHES;
PORCELAIN HOUSED TRIPOMATIC FUSE CUTOUTS;
DOUBLE DUTY FUSE CUTOUTS;
POLE TOP GANG OPERATED SWITCHES;
PORCELAIN HOUSED DISCONNECT SWITCHES;
N. E. M. A. HOOK OPERATED DISCONNECT SWITCHES;
FUSE LINKS;
FUSE LINK BOXES;
FUSE PULLERS;
SECONDARY FUSES;
SCREW ANCHORS;
EXPANSION ANCHORS;
FULL-VU GUY GUARDS;
GUY WIRE CLIPS AND STRAND BANDS;
ECONOMY CABLE CLAMPS;
DEAD-END SERVICE CLAMPS;
V-GROOVE SERVICE CLAMPS;
HITEMETERS;
"I" HOOKS;
CONDUIT STRAPS;
ABC SLEEVES AND MACHINES;
CABLE RING SADDLES;
FIT-RITE WIRE HOLDERS;
SLEEVE TWISTERS;
GROUND WIRE CLIPS;
GROUND CLAMP-TITES;
GROUNDING CABLE;
HI-LINE TOOLS AND ACCESSORIES;
CON-NEC-TAP CLAMPS;
GROUNDING SETS;
MASTERENCHES

KEARNEY PRODUCTS

MAYDWELL AND HARTZELL
INCORPORATED
LOS ANGELES SAN FRANCISCO

JOSLYN

POLE LINE HARDWARE

Manufactured in the West To Meet Western Needs

Whether it be transmission, distribution or electrical equipment and construction materials, JOSLYN can give economical and efficient service to Western utilities.

Make our complete stock your headquarters for pole line materials.

Write for catalog giving complete descriptions of items available.

We Represent:

PINCO Insulators
EVERSTICK Anchors
COLUMBUS Sturd E Tools
JOSLYN Fir Cross Arms
JOSLYN Wood Pins and Brackets
WESTERN Red Cedar Poles
COHOES Conduit
BULLDOG Knobs, Insulators, Tubes, Cleats, etc.
PLYMOUTH Insulating Tapes, Rubber and Friction
BURNLEY Soldering Pastes
HYKON Boring Device
PHILADELPHIA Magnet and Annunciator Wire
DOLPH Insulating Varnish
B.B. Galvanized Iron Wire and Steel Strand
NATIONAL copper sleeves

JOSLYN COMPANY
OF CALIFORNIA

FACTORY
5100 District Blvd.
LOS ANGELES

District Office
180 Potrero Ave.
SAN FRANCISCO

PLANNED LAUNDRY, inspired by the success of the planned kitchen, designed to lift the laundry from the basement to the first floor, convert it from a place of work to one of beauty, is a merchandising venture announced by Westinghouse Electric & Mfg. Co.

Nomenclature adopted at the third annual Kitchen Clinic is employed. This classifies laundry operations into four groups: collecting and sorting, washing, drying and ironing. The planned laundry, representing three years of study, is designed around these four centers. The laundries include movable bins, colorful settings, improved appliances and proper arrangement.

●

WWP Asks Permission To Buy Chelan Co.

Application for purchase of Chelan Electric Co. by the Washington Water Power Co. was being heard by the Federal Power Commission early this month. The Chelan company, which has generating stations at Grangeville, Lewiston and Chelan, is engaged in generation and sale of energy at wholesale only and has no customers other than the Washington Water Power Co., the application states. Of 5,000 shares of outstanding common stock (par value $100), 4,995 are owned by the Washington Water Power Co.

●

Idaho Falls Licensed To Build Snake River Plant

The City of Idaho Falls last month was granted a license by the Federal Power Commission to construct, operate and maintain a hydro-electric development at Upper Mesa Falls on the Snake River. The project includes a gravity concrete diversion dam 20 ft. high, an 835-ft. tunnel, a 5,000-hp. generating unit, utilizing 125-ft. head, and a 65-mi., 66,000-volt transmission line.

Eventual raising of head to 155 ft. and installation of a second 5,000 hp. unit are also approved. Construction of the first unit must begin before 1938, be completed before 1940.

●

FRANCHISE of the Northwestern Electric Co. in Portland, which expires in November, is the subject of an investigation by the city attorney. The city has the option to purchase the company's properties. Still open to the city is the offer made by the company a year ago, after the electorate had overwhelmingly defeated a proposed appropriation to determine purchase price by investigation. The offer is to extend terms of the franchise, including 5-per cent tax and the city's option to purchase.

Sierra Pacific Co. Celebrates Increased Use

Celebrating a 25 per cent increase in average domestic consumption during the past eighteen months, fifty dealers and their salesmen met with twenty-five members of the Sierra Pacific Power Co. organization in Reno, April 30, to commemorate the achievement of a goal of 1,250 kw.-hr. per domestic customer per year. The meeting climaxed five years of power company-dealer cooperation during which time the entire job of load-building in the company's territory has been done by the dealers.

Since the inauguration of the plan (ELECTRICAL WEST January, 1936, p. 31) average domestic consumption has increased from 885 kw.-hr. to 1,250, electric range saturation has grown from 26 to 48.5 per cent, and electric refrigerator saturation from 28.6 to 54 per cent. During 1936 the dealers sold 817 electric ranges, 1,099 refrigerators and 189 electric water heaters.

In pointing out how the consumer ultimately benefitted, H. A. Lemmon called attention to the fact that the average domestic rate had decreased from 5.44c to 3.92c, while average annual domestic revenue had decreased from $46.09 to $45.70. He told how the number of dealers on the company's lines had increased from 5 to 32 and pointed out that there is now one electrical appliance salesman for every 225 residence customers in the territory.

Fred Hodge, commercial manager, who acted as toastmaster, claimed that his was the most unique job in the country in that he had no sales department. He introduced the principal speakers who were George C. Tenney, editor of ELECTRICAL WEST, who spoke on "Cooperation and Salesmanship," Wm. A. Cyr, associate editor of ELECTRICAL WEST, who discussed lighting, and Harley Harmon, president of the Nevada Public Service Commission. Mr. Harmon emphasized the effect which greater use of electrical service and appliances has on customer relations. He reported that there had been a 90 per cent decrease in the number of complaints brought to the commission by individuals.

●

TWO NEW PUBLICATIONS of the National Electrical Manufacturers' Assn. are: Household Electric Refrigerator Standards No. 37-41 and Indicating Electrical Measurement Instruments and Instrument Transformer Standards No. 37-42. The first includes methods of computing gross volume in food shelf area, conducting and reporting no-load and ice-making tests. The second includes standard dimensions of indicating instruments and accuracy limits of current and potential transformers.

The Conduit That Never Fights Back

Youngstown Buckeye Conduit is like an extra helper on the job. Uniformly ductile, foot for foot, it will take a bend from the hickey without argument—and stay put. When the whole job is finally laid up, it will have that workmanlike appearance that owners rightly judge by.

Youngstown Buckeye Conduit is manufactured throughout by one organization. From the ore in the earth to the satin-smooth lacquer lining in the finished product, there is absolute control which allows no variations.

Clean threads, full cut, require no chasing. Uniform ductility and tensile strength make uniform bends possible, and without a flattening on the inside of the radius. The lacquer lining is as ductile as the metal, and so bends smoothly, with no flakes left to snag wires.

Bid on Youngstown, buy Youngstown—and know you will be backed up by a product that works with you for a better job and more certain profit.

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon and Alloy Steels • GENERAL OFFICES • YOUNGSTOWN, OHIO

Conduit • Tubular Products • Sheets • Plates • Tin Plate • Bars • Rods • Wire • Nails • Unions • Tie Plates and Spikes 264

YOUNGSTOWN

Reliable

Splicing Sleeves

For Copper, Copperweld and Galvanized Iron

Accurately made to meet most exacting requirements. Careful attention is given to small details in designing, testing and manufacturing of these items. You will find them especially satisfactory.

Made in accordance with N.E.L.A. suggested standards.

Write for bulletin.

Reliable ELECTRIC COMPANY
OVER 25 YEARS SERVICE TO THE UTILITIES
[illegible] AVE. [illegible] CALIF.

SECURITY SEEKER

He believes cash proceeds from life insurance are a boon when wisely managed. For example, a Life Insurance Trust may convert them into the security of a sound estate.

Our Trust Officers will gladly explain such a bulwark to your life insurance.

TRUST DEPARTMENT

CROCKER
FIRST NATIONAL BANK
of San Francisco

BARTLETT
Tree Trimming Tools

No. 777 Two Hand Pruner
Drop forged tool steel. Rapid cutter. Blade may be placed next to main limb of tree with hook handle held in LEFT hand. Right hand is FREE to operate blade. 26" handles.

No. 1-B Tree Trimmer
Most powerful compound lever Tree Trimmer made. Will easily sever branches up to 1¼" diam. 6 to 16 ft. lengths. Other types.

No. 43 and 44 Pole Saws
For pruning larger limbs than our No. 1 Tree Trimmer. No. 43 has 12 in. drag tooth blade. No. 44 has 16 in. peg tooth blade with 7 teeth per inch. Saw is adjustable. Light weight.

Bartlett Tree Paint
For destroying and preventing the growth of wood destroying fungi and for the protection of wounds, use Bartlett's Tree Paint. Easily applied with ordinary paint brush.

BARTLETT MFG. CO.
3053 E. Grand Blvd. Detroit, Mich.

Our Lamp Changers and Test Pikes are made to fit trimmer handles.

Send for Catalog No. 23

SAN MATEO ELECTRICAL CONTRACTORS ASSN. is operating under a code of Fair Trade Practice, involving the filing of duplicate bids in a depository (the branch bank of Bank of America) four hours prior to opening time. After bids are opened by the awarding authority the duplicate bids are opened, tabulated and copies of the tabulation sent to all bidders. A fee of 25 cents is levied to reimburse the bank for the handling of the bids.

●

TO SUPPLY SALT SPRINGS ISLAND with its first commercial electric service, one of the largest cable reels ever handled in British Columbia was employed. Drum and 15,600 ft. of cable weighed 33 tons. Cable and reel were constructed by the Phillips Electric Works, Ltd., and delivered to the Nananimo Duncan Utilities, Ltd.

●

HOLDING COMPANIES of public utilities were warned last month by James M. Landis, chairman of the Securities & Exchange Commission, that they are making a "tremendous mistake" by failing to register under the holding company act. He said that only 84 of the 235 companies subject to the law have registered, and that those who have not are opposing the whole concept of federal regulation.

●

SEWARD, ALASKA, has called for contract bids for construction of a $90,000 municipal diesel electric plant and distribution system. Proposals will be received until June 7. This is the second time bids have been invited. At the first opening held last October, only one bid was received, later rejected as being too high. Original plans specified a hydro plant.

●

PLANS FOR ENLARGING the electrolytic zinc plant of the Sullivan Mining Co. at Kellogg, Idaho, by 50 per cent, at a cost of $1,000,000, were approved by Hecla Mining Co. directors late last month. The plant, operating at full capacity, last year produced 21,000 tons refined zinc. Maximum present demand is 10,000 kw.

●

MERCHANDISING activities of the British Columbia Electric Railway Co. are being scored up on a chart labeled "Coronation Derby". Horses represent sales divisions and quotas are interpreted as handicaps.

●

THE CRESCENT POWER & LIGHT CO. of Reardon, Wash., was incorporated as a non-profit corporation last month by A. C. Carstens, A. H. Carstens, Warren Emley, M. W. Landreth and Frank Paul.

REA Projects Started, More Allotments Made

The rural electrification program of REA was inaugurated in the Pacific Northwest last month with the opening of bids on two projects and the calling for figures on five others.

Roberts & Broad, Spokane, submitted the low bid of $77,887 to the Clarks Fork Rural Electrification Assn. at Thompson Falls, Mont., for construction of 80 miles of lines. O. A. Carlson Electric Co., 2212 Second Ave., Seattle, was low at $17,949 for building an electrical distribution system near North Bend, Wash., for the Mutual Power & Light Assn. of Tanner. The five projects for which bids have been asked are all in Montana.

Allotments of the Rural Electrification Administration to May 7, totaled $58,952,958. Of this, $1,980,000 will be used for building generating plants, and most of the remainder for line construction. Loan contracts totaled more than $45,500,000 of the allotted funds. Among recent allotments are:

The Surprise Valley Electrification Corporation, Alturas, California, up to $500,000 to build 344 miles of line and a generating plant, 900 kw., to serve 809 customers. The project in California and the one in Oregon have been combined.

To the Sun River Electrification Assn. of Simms, Montana, a loan of up to $100,000 to build 106 miles of line to serve 345 customers.

To the Inland Empire Rural Electrification, Inc., St. John, Washington, a loan of up to $455,000 to build 463 miles of line to serve 1530 customers; $90,000 was previously allotted.

To a cooperative in Grays Harbor county, Wash., $60,000 to build 23 miles of line to serve 150 customers. and a 250-kw. hydro-generating plant.

To the Ravalli County Cooperative Electric Assn., Corvallis, Mont., an allotment of $8,600 for house-wiring and plumbing; a loan of $125,000 to build 125 miles of line to serve 400 customers.

To the Morgan County Rural Electric Assn. of Fort Morgan, Colo., up to $250,000 to build 248 miles of line to serve 644 customers.

To the Clearwater Valley Light & Power Assn., Inc., at Lewiston, Idaho, up to $400,000 to build 300 miles of line to serve 900 customers.

To the Blachly-Lane County Cooperative Electric Association, in Oregon, a loan of up to $108,000 to construct an 80-kw. portable generating plant and 87 miles of line to serve 420 customers.

●

VIEWS of the Vancouver Electrical Assn. in connection with a proposal to increase civic license fees in Vancouver were presented to a committee of the City Council recently by S. F. Ricketts, secretary of the association. Mr. Ricketts stated his members were agreeable to paying the additional fees proposed, if unlicensed workers were prohibited from doing electrical work and provisions for the granting of licenses tightened.

MAINTENANCE COSTS REDUCED- BY

100 Amp. S&C Fuse Link

1 Amp. S & C Fuse Link with section cut away.

REG U.S. PAT OFF

Fuse Links

S & C Fuse Links cut maintenance costs, stop needless service trips and outages because they blow ONLY in case of system trouble, apparatus failure, or insulator flashovers.

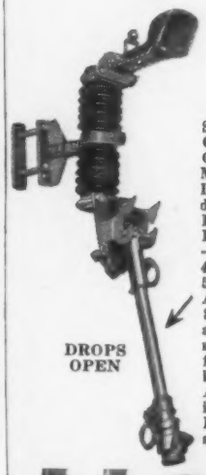
They are accurately made, maintain original time-current characteristics (note the absence of any soldered joints). Experience on distribution systems prove that operating maintenance costs have been reduced with S & C Fuse Links.

S & C Fuse Links are designed on the same principle as the fuse element in S & C Liquid Fuses that have given you such satisfactory protection on your power stations.

You Can Apply S & C Fuse Links on Your Small Transformers as Low as 1 Amp.

You don't need high capacity links to get mechanical strength. The 1 Amp. S & C Fuse Link is the strongest link made and it will fit all types of cutouts ..... It is the ONLY Universal Link.

Let us mail our treatise on "Fuse Links"—Bulletin 218.



S & C SEMAFOR CUTOUTS Open Type. Made in Light, Medium and Heavy Duty Types — 5,000 to 46,000 V., 50 and 100 Amps. Semafor action signals when fuse is blown. Also made in Recloser Fuse assemblies.

The new S & C Enclosed Cutout — clears faster — for 5,000 and 7,500 12,500 Y Volts Systems, 50 and 100 Amps.

SCHWEITZER & CONRAD, Inc.
4435 RAVENSWOOD AVENUE, CHICAGO, ILL.

WESTERN REPRESENTATIVES
San Francisco: Geo. E. Honn, 420 Market Street
Los Angeles: Farnham & Cunningham, Edison Bldg.
Seattle: T. S. Wood, 220 Ninth Street, North
Salt Lake City: Riter Engineering Co., Kearns Bldg.

NAPA, Calif., has adopted the Standard Electrical Ordinance of the Pacific Coast Electrical Bureau, according to Frank Kiefer, northern field manager.

●

DEMONSTRATION PAYS in lighting as well as in selling of any other merchandise, it is being found by the lighting staff of the Southern California Edison Co. Ltd., according to George Rankin, director of lighting. Excellent results are being had with the portable floodlighting equipment which is set up for demonstrations at schools and playgrounds to demonstrate the possibilities of night play with adequate light. Eight cars of the Edison company are equipped with the demountable masts and demonstration lighting units. The entire staff makes good use of this equipment.

●

CONTRACTS FOR CURB LIGHTING two downtown Spokane streets for the next ten years, have been awarded the Washington Water Power Co. Cost, $82,000, is estimated 10 per cent under that of the past decade.

●

GRAYS HARBOR Railway & Light Co. last month completed installation of its 23,000-volt line and transformers to serve the Harbor Plywood Co., and other industries at Grays Harbor, Wash.

The services of Electrical Testing Laboratories in a confidential capacity are available for determination of performance and quality

Know by Test

ETL

80th Street and East End Avenue
New York, N.Y.

40 years in the service of the electrical industry

ELECTRICAL TESTING LABORATORIES

About People

Utah P & L Promotes Hale and Fuller

Heading a series of promotions in the Utah Power & Light Co. was the appointment of J. A. Hale to the vice presidency of both the power company and the Utah Light and Traction Co. L. B. Fuller, former superintendent of power, was made chief engineer. H. H. Krueger, former assistant superintendent of power, advanced to the superintendency.

Chief Engineer Fuller has been in the utility business since 1901. He became assistant superintendent of the Utah company in 1927 and superintendent two years later. Mr. Krueger, who joined the company in 1914, was made assistant superintendent of power in 1930.

●

BECAUSE OF ILL HEALTH, W. H. McGrath, executive vice-president of the Puget Sound Power & Light Co., in charge of operation, has turned over his work to Vice-President S. P. MacFadden. Other changes announced by President Frank McLaughlin include promotion of L. E. Karrer, former assistant to the president, to the post of executive assistant. McGrath will continue service on the board of directors.

●

LT. COL. CHARLES F. WILLIAMS, U. S. District Engineer, Portland District, in charge of Bonneville Dam construction since its authorization, has received orders to report for duty at Fort Leavenworth, Aug. 1. Previous orders had directed Col. Williams to Fort Belvoir, Va. He expects to leave Portland about the middle of July.

●

H. B. DWIGHT, gas and electric engineer for the Colorado Public Utilities Commission for the past 18 years has been granted a year's leave of absence because of poor health.

●

NEIL H. PETERSON recently was elected president of the Air Conditioning Society of San Francisco. W. W. Sandholt, York Ice Machinery Corp., was chosen vice-president, and Jared A. Hill, Pacific Gas & Electric Co., secretary. J. W. Wrenn was voted an honorary life-membership for valuable contributions during the past five years.

●

F. C. POAGE, formerly of the engineering department of the Idaho Power Co., Boise, has joined the staff of Ebasco Services, Inc., with headquartes in New York City.

A LEADING LINE
FOR EVERY LIGHTING NEED

BETTER LIGHT MEANS BETTER LIGHTING VALUE, TOO • PROVIDE THE BEST IN QUALITY, EFFICIENCY AND PERFORMANCE BY SPECIFYING WESTINGHOUSE...LARGEST MAKER OF COMPLETE LIGHTING EQUIPMENT

★ COMMERCIAL

★

Leading the Westinghouse commercial line of luminaires is the famous MAGNALUX, finest commercial luminaire on the market. Offices and stores most popular applications. Another similar unit is SILVURN with attractive, efficient aluminum basin finished by Alzak process. Leading applications — stores, lobbies, display rooms. For semi-indirect and direct enclosing globe luminaires there's none finer than Westinghouse Lunaire, Lunalux, Magnalaire, Sollaire, Sollux and Sollite lines. Be sure you have complete facts.

★ INDUSTRIAL

★

High Intensity Mercury, because of its entirely new lighting efficiency, is rapidly revolutionizing industrial lighting. Westinghouse Mercury equipment has taken the lead, first, because of dependability and performance; second, because Westinghouse is the only maker of complete High Intensity Mercury equipment — reflectors, ballast equipment, lamps and accessories. Westinghouse is also a member of the RLM Institute, offering this reflector for incandescent lighting plus a complete line of reflectors built to equally high standards.

★ FLOODLIGHTING

★

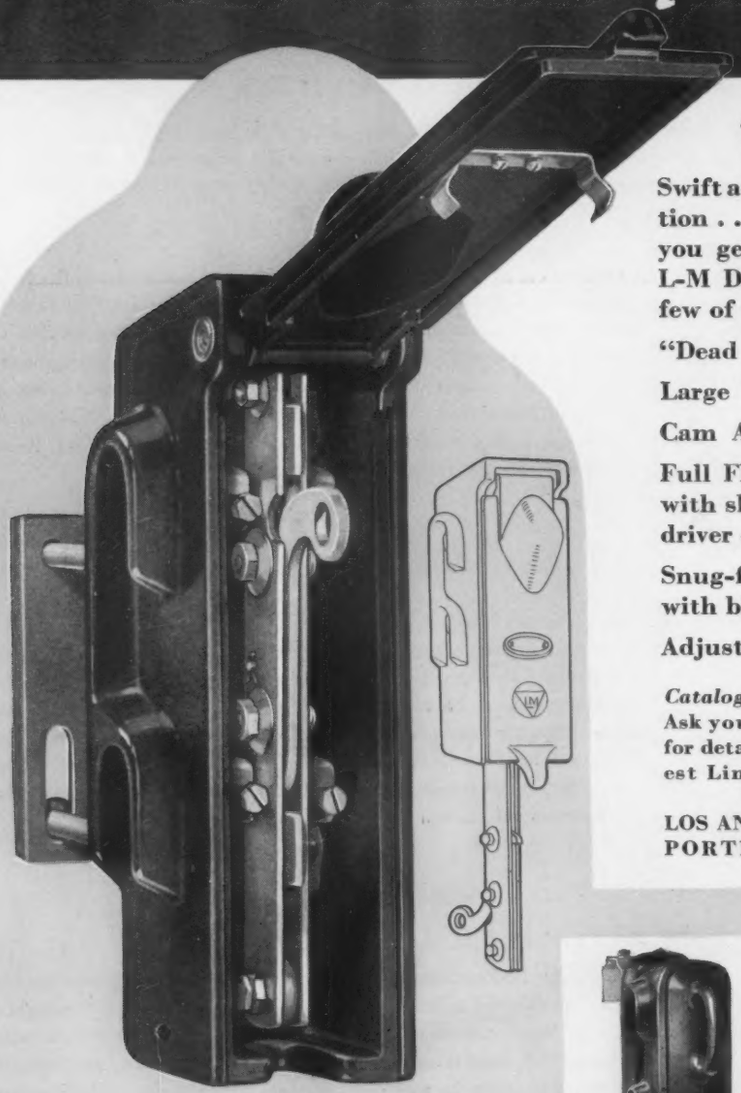
Demand for floodlighting is rapidly increasing in old and new applications. The demand is largely for an efficient enclosed-type floodlight of low cost. Westinghouse meets the demand with a new line of Floodlights —the A-LINE. Sized from 8 to 20 inch reflectors, with many new features, this new line leads the way. Get complete facts about the A-LINE as well as other Westinghouse enclosed, open and underwater type Floodlights.

See your Westinghouse Jobber for details and catalogs. Westinghouse Electric & Manufacturing Company, Lighting Division, Edgewater Park, Cleveland, Ohio.

WHEN YOU THINK OF *Lighting* THINK OF

Westinghouse

Another PORCELAIN HOUSED L-M DISCONNECT SWITCH *with Features You will Like*



7500 V, 400 A

Swift action... safe, convenient operation . . . long, dependable service . . . you get them all in this new design L-M Disconnect Switch. Here are a few of the features you'll like:

"Dead Hinge" type blade for safety.

Large Pull Ring for easy operation.

Cam Action Blade for quick action.

Full Floating Clamp Type Terminals with slotted hex heads fitted by screw driver or socket wrench.

Snug-fitting Bakelite door stays closed with blade in open or closed position.

Adjustable Cross Arm Hanger.

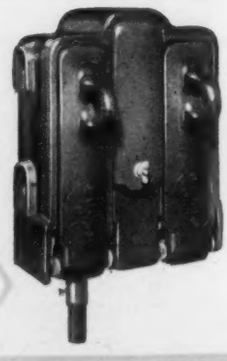
Catalog Number is C-353003-1.
Ask your L-M representative for details, or write your nearest Line Material Co. Office.

L-M Offices at
LOS ANGELES . . OAKLAND
PORTLAND . . SPOKANE

Two L-M Fuse Cutouts
Built to Protect

Type "PVD"
Drop-out Fuse Cutout — 5000 and 7500/125000 V, 60 and 150 Amperes.

Type "RP"
Reclosing Fuse Cutout — with Built-in Time Delay 5000 Volts, 50 Amperes.



LINE MATERIAL CO.

ROBERT T. STRONG of Seattle has been appointed Pacific Coast transportation manager for Westinghouse Electric & Manufacturing Co. with headquarters in

R. T. STRONG

San Francisco. For the past eleven years Mr. Strong has been in charge of the railway, aviation and marine sales of the company in Seattle.

●

JOHN D. SIMONS has joined the F. B. Connelly Co. as district representative for Montana. The firm will renew service to Montana dealers in Grunow refrigerators and radio, business being handled through the Spokane house.

●

TWO ADDITIONS to the home economics staff of Proctor & Schwartz Electric Co's. district office at 104 Ninth St., San Francisco, Miss Effie Jardine and Mrs. Blanche Brown.

●

PAUL S. EVERLEY, 329 Minna Street, San Francisco, is now representing the Kuhlman Electric Co., transformers, and the Electric Machinery Mfg. Co., synchronous motors.

●

E. E. WALKER, sales engineer British Columbia Electric Railway Co., has been elected secretary of the Vancouver Rotary Club.

●

ROBERT A. YOUNG is now a sales engineer for Maydwell & Hartzell, Inc. Operating out of the Los Angeles office, he covers the southern California territory, where he is well known through previous association with the electrical industry there.

●

W. J. McKEEN, acting superintendent of Seattle City Light, has asked a special appropriation of $100,000 to buy fuel oil for Lake Union steam plant. McKeen said that because of inadequate stream flow this year's $35,000 for fuel oil was used during January and February.

●

F. E. Ross, formerly merchandise sales director of the Puget Sound Power & Light Co., Seattle, resigned this position in May to join the Westinghouse Electric & Manufacturing Co. in Mansfield, Ohio, in the merchandise advertising department. He will give special attention to refrigeration advertising. Mr. Ross was active in the Business Development Section of the Northwest Electric Light & Power Association and was to have been chairman of the Residential Sales Bureau next year.

●

J. IRVING COLWELL, Seattle manager of Graybar Electric Co., Inc., last month was one of three westerners nominated for regional trustee of the Princeton Alumni Assn. mid-winter meeting of the Association at Princeton. He is a graduate of the class of 1904.

●

JOSEPH E. RUCKER, Seattle electrical engineer and refrigeration expert, died in Seattle recently following a two months' illness. He was born in July, 1889, in Savannah, Ga., and is survived by his widow, Bessie Knettle Rucker.

Underground Transmission

Note the air and moisture proof flexible coverings. Sealtite represents a distinct advance in parkway cable construction. It is more pliable than any other underground cable... and costs are considerably lower.

Without Conduit

Write for booklet offering suggested uses and explaining long life.

SEALTITE

Parkway and Airport Cable with Maximum Flexibility by

PROVIDENCE

MAYDWELL & HARTZELL
INCORPORATED
ELECTRICAL ENGINEERS
and
MANUFACTURERS' REPRESENTATIVES
Los Angeles ★ San Francisco

One of two 150 K.V.A. Gardner Transformers installed by the Bear Valley Utility Co., Pineknot, Calif. Capacity of units is 33,000/31,350/29,700 to 2400/2300/2000 volts.

GARDNER TRANSFORMERS

Choice of Bear Valley Utility Company Because of Their Reliable Performance

● YEARS of trouble free efficient operation is designed into every Gardner Transformer. That is why the Bear Valley Utility Company purchased two 150 K.V.A. Gardner Transformers to meet the most exacting service requirements. These sturdily built units, in operation for over a year, have kept maintenance costs down to a minimum.

Let us show you how you can eliminate costly trouble, and save money by installing Gardner Transformers. They are made in the only plant in the west specializing in transformers for standard use as well as for special purposes. Nearly 30 years of experience enables us to assure complete satisfaction at most reasonable prices. Write today for description catalog.

Gardner Electric Mfg. Co.

4227 Hollis St. Emeryville, Calif.

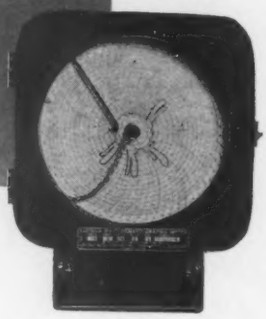
REPRESENTATIVES:

Geo. E. Hoan Co., 429 Market St., San Francisco, Calif.; Utilities Supply Co., 1736 E. 15th St., Los Angeles, Calif.; Industrial Electric Co., 1304 Stewart St., Seattle, Wash.; Modern Electric Co., 37 Richards St., Salt Lake City, Utah; Kranefeld Eng'g. Co., 3416 14th Ave., Denver, Colo.

LINCOLN DEMAND METERS

THE *correct* PRINCIPLE

Type CCW Graphic Demand Meter



The capacity of generation and distribution equipment is directly related to the heating effect of the load imposed. Likewise the registration of the Lincoln Maximum Demand Meter depends upon the heating effect of the load.

LINCOLN METER COMPANY
SPRINGFIELD, ILLINOIS

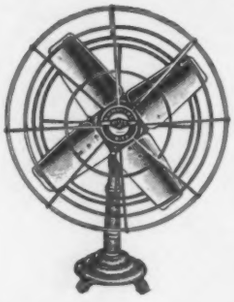
KISCO PROVIDES COOLING COMFORT

The AIRistocrat "Deflecto"

Here is the last word in air recirculation. This new model was designed for both appearance and performance. In it, we have embodied the patented "Deflecto" principle, which is recognized for its unique method of air recirculation.

Exhausters—Motor and Belt Drive

Offered with single and two speed control; also belt drive in sizes up to 48". Kisco Exhausters are sold on performance — air delivery — and not inches. Ruggedly constructed, attractively finished.



"DeLuxe" Air Movers and Coolers

Offered in four models, Pedestal, Hi-Boy Pedestal, Ceiling, and Wall-Bracket. Each of these models is offered in two sizes and the performance is guaranteed.

"Breezy Tales of Summer Sales"

Have you received your copy of this new photo manual? If not, write today.

SMALLCOMB ELECTRIC COMPANY
507 E. 7TH ST. LOS ANGELES, CALIF.
KISCO COMPANY, INC. ST. LOUIS, MO.

JAMES W. RYAN, works superintendent of the Westinghouse Porcelain Plant at Emeryville, Calif., last month became the first employee in the Pacific Coast district to receive the silver W medallion, awarded for distinguished service.

●

CARL E. SPROUT has been appointed an associate of B. W. Sayer, district manager of the Portland office of the Foxboro Co.

●

W. T. CHRISTY was appointed manager of the Range and Water Heater Section, Appliance and Merchandise Department, General Electric Company, June 1. J. R. Poteat will continue as sales manager of the Section.

●

R. E. TOWNE, Tacoma engineer, has been retained by public utility districts in Pacific, Lewis, Cowlitz and Wahkiakum counties, all in Washington, to evaluate all electric utility properties in those counties. Officials of the West Coast Power Co. and the Willapa Electric Co. have notified utility district commissioners of their willingness to negotiate for purchase of their properties.

●

CLYDE L. SEAVEY, for many years a member of the California State Railroad Commission and more recently a member of the Federal Power Commission, has been elected vice chairman of that body succeeding Basil Manly.

●

C. H. ALVORD, sales manager of the Hart Manufacturing Co., Hartford, Conn., was a recent visitor to the Pacific Coast.

●

PERRY O. CRAWFORD, president of the American Utilities Service Corp., Savanna, Ill., visited the Pacific Coast in May, to attend a dinner honoring Dr. Durand of Stanford University. Mr. Crawford will be remembered as former vice-president and general manager of The California Oregon Power Co.

●

ALBERT F. KESSING, 51, sales manager of the air-conditioning division of the Frigidaire Corp., died last month following a heart attack. He was stricken while on a fishing trip near San Diego.

●

R. C. ENGLISH, formerly of the Northwestern Electric Co. sales staff at Portland, has taken the Northwest territory for the Miller line of commercial lighting fixtures.

●

A. E. CLARKE, Smoot-Holman Co., Inglewood, Calif., is on a six weeks trip contacting representatives and wholesalers of the eastern territory.

●

C. A. RUSSELL, Wesix sales manager, is on a six-weeks tour of south-eastern states.

WALTER PRICE has been made manager of the Glendale, Calif., Electrical Contractors Assn. One time manager of the San Francisco association, Mr. Price has for several years been manufacturers' representative and salesman in California.

●

H. L. DOOLITTLE, chief designing engineer of the Southern California Edison Co., has been elected president of the Pasadena Engineers' Society.

●

J. R. GABBERT, advertising manager, Nevada California Electric Corp., recently resigned as a member of the State Board of Education in spite of Governor Merriam's request that he stay on. Mr. Gabbert said other work necessitated his resignation.

●

Five officials of the Nash-Kelvinator Corp. toured the West in a series of meetings with commercial distributors. A. H. Reinach, J. A. Harlan, L. G. Estep, A. U. Saloman, and H. H. McCaughey were of the party, which originated in Detroit and toured the country.

●

HERMAN E. HELD will continue in San Francisco as representative of the Weston Electrical Instrument Corp., with offices at 420 Market St.

W. M. ARMSTRONG, illuminating engineer, graduate of the Stanford Illuminating Engineering School, has recently joined the von Hamm-Young Co., Ltd. as a member of the electrical products department in Honolulu, T.H. Mr. Armstrong was an associate instructor at Stanford, then joined the staff of Incandescent Supply Co., San Francisco, and more recently was with a wholesale house in Stockton.

●

WILLIAM F. LITTLE, treasurer of the Illuminating Engineering Society and one of its past presidents, spoke to groups of I.E.S. members in Los Angeles, Portland, San Francisco, Spokane and Butte on a Western tour on behalf of the Electrical Testing Laboratories, for which he is in charge of the photometry division.

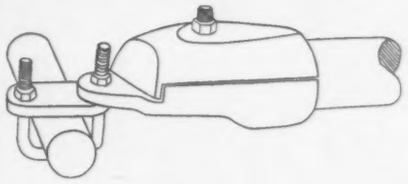
●

S. L. CORDIS recently moved from Pheonix, Ariz. to Seattle, Wash., to assume his new duties as branch manager of the Seattle office of the York Ice Machinery Corp.

●

MILDRED HICKNER, Hotpoint home economist of Chicago, after a brief visit to the Pacific Coast, sailed for Honolulu to conduct the cooking school which has become a feature there each season.

★ *The* HARTMAN *Line* ★



THE HARTMAN Protective Type Ground Clamp is the only threadless clamp that will receive the grounding conduit at any angle without having to bend it. Easy to install and neat in appearance. Made for rigid or thin wall conduit. A complete line of U-bolts are carried in stock from 1¼ inches to 6 inches inclusive.

WEATHER PROOF SOCKET

Made of aluminum alloy with a high polish finish. Built to hold heavy reflectors at any angle. Neat in appearance—easy to install.

For information see your jobber or write direct.

B. HARTMAN

168 Sunset Street
LONG BEACH, CALIF.

● THE RECORDS OF HUNDREDS OF WESIX AUTOMATIC ELECTRIC HEATING INSTALLATIONS IN HOMES IN ALABAMA, TENNESSEE, MISSISSIPPI, GEORGIA, WASHINGTON AND CALIFORNIA SHOW AN:

Average annual load factor of 43%
and feeder diversity . . . . . 4 to 1
and annual consumption per home of 5,000 to 30,000 k.w.h.; thousands of satisfied users, on equitable rates

People like electric heat, as exemplified by Wesix heaters with their balanced heating effect and integral automatic control.

Because it provides pleasing personal comfort Wesix automatic electric heating brings fuller consumer appreciation of electric service.

A lot of high load factor Wesix electric heating can be folded into utility systems with no new cost to serve and a consequent improvement in load factors, particularly where cooking and water heating has reached a high saturation.

Write for information on Wesix high load factor heaters, demand controls, thermostats and timers. Be "Wesix-wise."

WESIX AUTOMATIC ELECTRIC HEATING IMPROVES LOAD FACTORS

WESIX ELECTRIC HEATER COMPANY

390 First St., San Francisco, Cal. 1238 N.W. Glisan St., Portland, Ore. 2424 E. Eighth St., Los Angeles, Cal. 3221 Western Ave., Seattle, Wash.

Specify CHROMALOX Super-Speed

Sell

the high-grade ranges that use these top burners. Let the burners help you sell. Point out their exceptional service-giving features—their speedy cooking, their economy, their immunity to damage, their long life. Sell *modern* electric cooking — *contact* cooking, as provided by flat-top CHROMALOX Super-Speed units.

Use them for replacements, too — they fit any range.

Represented by

MONTGOMERY BROTHERS
911 Western Ave., Seattle, Wash.
1501 N. W. Kearny St., Portland, Ore.
61 Fremont St., San Francisco, Calif.
912 E. 3rd St., Los Angeles, Calif.

THE PETERSON COMPANY
1921 Blake St., Denver, Colo.

EDWIN L. WIEGAND CO.
7540 Thomas Blvd. Pittsburgh, Pa.

THERE ARE "BESTS" IN EVERY INDUSTRY

IN ELECTRICAL APPLIANCES IT'S

Sunbeam

★ Automatic MIXMASTER ★ Double-Automatic IRONMASTER ★ Silent AUTOMATIC TOASTER ★ COFFEEMASTER ★ WETPROOF HEATING PAD ★ MASTER CORD and PLUG SET ★ GLASS COFFEE MAKERS FANHEATER ★ FLAT TOASTER ★ Automatic CLOTHES SPRAYER.

Made and guaranteed by

CHICAGO FLEXIBLE SHAFT COMPANY
5600 West Roosevelt Road, Chicago, Ill.
316 Commercial St., Los Angeles, Cal.
921 11th Ave. N., Seattle, Wash.
47 YEARS MAKING QUALITY PRODUCTS

A. E. SMITH, formerly Industrial control specialist of the General Electric Co., San Francisco, has joined the West Coast Electric Works, Ltd., 166 7th St., San Francisco.

●

W. H. BURLESON has been appointed manager of the Power Utilities Department, Ohio Brass Co., Mansfield, Ohio. He will supervise sales of insulators, fittings and hardware, and bushings. A graduate of the College of Texas, he at one time was assistant chief engineer of the Texas Power & Light Co.

●

WILLIAM G. MARSHALL, head of Marshall Electric, Vancouver, B.C., recently was reelected president of the Kerrisdale Merchants' Assn.

●

R. G. TOWER has been appointed Pacific Coast district manager of the Bristol Co., instrument manufacturers, with headquarters in the Rialto Bldg., San Francisco.

●

R. O. JONES of Vancouver has been appointed city electrician at Grand Fork, B. C. He was for a time with the B. C. Electric Railway Co., and later installed a hydro plant in Fraser Valley.

●

MAX W. BABB, president of the Allis-Chalmers Manufacturing Co., Milwaukee, is visiting the Pacific Coast offices of the company, obtaining a firsthand picture of business conditions in this region.

●

ARVID WICKSTROM has been appointed representative in the Minneapolis territory for the Pacific Electric Mfg. Corp.

●

HARRY HIGGINS of Chelan, Wash., has purchased the electrical business of Nicholson & Hupp at Wenatchee, Wash.

●

JOHN BUSEY, president of the General Electric Supply Corp., Bridgeport, Conn., visited the coast branches of his organization during March. Before going east several years ago, Mr. Busey was an executive in the Pacific Coast division of G. E. Supply Corp.

●

APPOINTMENT OF THREE regional range supervisors in the West was announced last month by the Norge-Kelvinator Corp. They are Harry J. Moeller, Seattle; R. H. Jancke, Denver, and C. N. Smith, San Francisco.

●

J. R. KAISERMAN, division manager at Livingston for 21 years for the Montana Power Co., last month became manager of the Helena division. He suceeds R. O. Kerr, Helena manager since 1930, who was transferred to the general offices in Butte.

Classified Section

- **COST of undisplayed classified ads is 5 cents a word, minimum $1.00 insertion. Box numbers in care of our San Francisco office count as 10 words additional in undisplayed ads.**
- **RATES per column inch of displayed ads is $3.75.**
- **ALL classified ads are payable in advance.**

ELECTRICAL WEST 883 Mission Street San Francisco, Calif.

REPRESENTATIVE WANTED—Well established manufacturer of Rigid Steel Conduit and fittings expanding sales organization will consider reliable manufacturer's agent as representative. Give complete details as to territory covered, lines carried, etc. Box 85, Electrical West, 883 Mission St., San Francisco, California.

PROFESSIONAL SERVICES

ELECTRICAL TESTING LABORATORIES

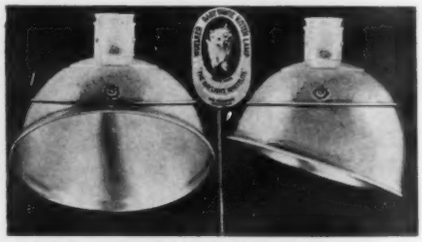
Electrical Photometrical, Chemical and Mechanical Tests. Inspection of Materials and Apparatus at Manufactory.

80th St. and East End Ave., New York

ARTHUR R. KELLEY
CONSULTING ENGINEER

Reports and Valuations, Public Utility Industrial Properties

Edison Bldg. Los Angeles



WUELKER BABY WHITE KITTEN LIGHTING UNITS

Flexo-Domes . . . Wuelkerlites . . . Adjus-To-Angles . . . . Floodlighting Interior and Exterior . . . . Show Window Lighting . . . . Theatrical Lighting General Illumination . Lighting Units Made to Order

WUELKER ADJUSTABLE LIGHTING UNITS DIRECT LIGHT

WUELKER LIGHTING COMPANY
889 Pacific Avenue, San Francisco, California

FOR
- *Lasting Economy*
- *Strength*
- *Safety*

USE LOCUST PINS Oak Brackets and Pole Steps

LOCUST PIN CO. FRONT ROYAL, VA.

Maydwell & Hartzell, Inc.
Los Angeles ★ San Francisco

About the Trade

K. T. Norris Buys Woolwine Metal Co.

Purchase of the Woolwine Metal Products Co., Los Angeles, by K. T. Norris, was announced last month when the 25-year-old firm began business under the name, Woolwine-Norris Corp.

Principal products of the Woolwine company are Woolwine electric ranges, electric water heaters, and other metal products.

Mr. Norris, who assumed active management of the corporation, will continue to operate both plants. With few exceptions, personnel will remain the same. H. H. Newton will continue as sales manager; Fred Pence, superintendent, and Harry Moody, chief engineer.

●

A SIX-STORY, electrically-heated building to house the offices, warehouse and display room of the General Electric Co., G. E. Supply Corp., G. E. Contract Corp., and G. E. Merchandise Department, will be built soon in Los Angeles. It will contain 250,000 sq. ft. of floor space, is estimated to cost $700,000. Three stories are scheduled to be ready for occupancy by September.

●

THE OAKLAND Electric Club and East Bay Engineers Club, Oakland, Calif., staged a joint meeting last month when A. W. Copley, Westinghouse Electric & Manufacturing Co., spoke on "The Mount Wilson Telescope".

●

ANNUAL OUTING of the Electrical Estimators Club of Los Angeles will be held May 22 at Elysian Park, according to Geret Kritzer, president.

●

CUTTLER-HAMMER, INC. has opened a sales office for the Southwest at 624 Santa Fe Bldg., Dallas, Texas. The office will carry a stock of standard apparatus, handle sales for the company's complete line of electric control equipment.

●

HUME & RUMBLE, LTD., electrical contracting firm, recently moved into new headquarters at 313 Water St., Vancouver, B.C. Extensive remodelling preceded the move. A large branch is maintained in New Westminster, B. C.

●

ACCURATE MANUFACTURING CO., Garfield, N.J., manufacturers of friction tape and splicing compounds, has announced the appointment of F. J. Airey & Co. as representatives in southern California and Arizona.

STEEL STRAND ❖ WIRE

Crapo GALVANIZED PRODUCTS

STEEL STRAND MADE TO RIGID SPECIFICATIONS

Crapo Galvanized Steel Strand is a highly specialized product scientifically manufactured under direct laboratory supervision. Each grade and size is produced from start to finish to meet the exacting demands of the service for which it is intended. Each wire used in forming a particular size and grade is made from the same special steel, processed in the same way, and galvanized by the *Crapo* Process.

For further information consult the nearest distributor of *Crapo* Galvanized Products, or write direct!

INDIANA STEEL & WIRE CO.
Muncie, - - Indiana

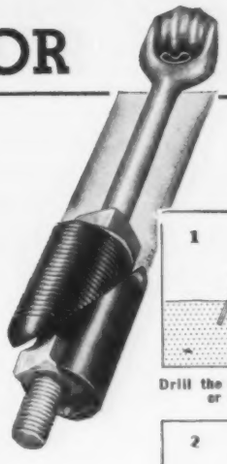
A NEW
ROCK ANCHOR

NO MORE LEAD OR CONCRETE

Here's a new rock anchor that has created a lot of enthusiasm wherever it has been shown or demonstrated because it does the job easier, better and more economically than anything ever used for anchoring in solid rock. It's installation is simple (see illustrations 1, 2 and 3). No heating lead or mixing concrete is necessary.

The expanding action wedges the anchor into the hole. Tests prove it will do the job.

Ask the Chance man or your jobber's salesman for a demonstration, or write for details. You'll be enthusiastic, too.



Drill the hole by hand or power.

Drop ancher into hole.

Expand ancher by turning rod. Large eye admits bar for wrench.

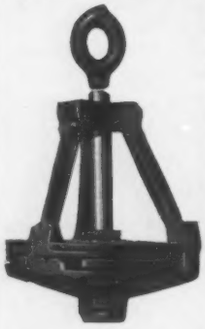
DISTRIBUTED BY G. E. SUPPLY CORP.

A·B·CHANCE CO. Utilities Division
CENTRALIA MISSOURI

THE SAFE ANCHOR FOR R. E. A. CONSTRUCTION!

For long life and economy in annual maintenance cost, Everstick Anchors are first choice in rural electrification construction. Their safety and dependability have been proven on millions of miles of electric lines.

ANCHORS FOR EVERY PURPOSE



The complete line of Everstick Anchors offers three expanding types in a complete range of sizes and holding capacities. Also rigid type Cone Anchors in all sizes. Made of malleable iron with its properties of strength, elasticity and rust resistance. Write for new bulletin "Everstick For Rural Electrification."

The Everstick Anchor Co. ☆ FAIRFIELD, IOWA

HONN'S SERVICE BUILDS BUSINESS

Geo. E. Honn Company

420 Market St., San Francisco

Manufacturers Representative for:

Tree Trimming Equipment
- Bartlett Manufacturing Co.

Friction and Rubber Tapes
- Clifton Manufacturing Co.

Pyrex Insulators
- Corning Glass Works

Transformers
- Gardner Electric Mfg. Co *Power and Distribution Transformers*
- Lee Skipwith & Co., Inc. *Niagara Air-Insulated Current Transformers*

Poles and Cross Arms
- Mineralized-Cell Wood Preserving Co.

Cable Grips
- Kellems Products Inc.

Neon Multiple Plug Fuses
- Pacific Indicator Co.

Fuses, Cutouts, Protective Devices
- Schweitzer & Conrad, Inc.

Connectors, Ground Rod Clamps, Utility Hoists
- Jasper Blackburn Products Corp.

BONDED REFRIGERATION Sales and Service, Inc., has opened headquarters and showrooms for the San Joaquin Valley territory at 2608 Tulare Street, Fresno. Walter Hoffman is district manager of the unit, which will carry a line of domestic and commercial refrigeration equipment, maintain 24-hour service.

●

HENRI J. LEVASSEUR, for the past few years on the sales staff of Northwestern Electric Co., Portland, has been promoted to dealer contact man. W. R. Edlund, former dealer contact man, has taken a position with Electrical Distributing, Inc.

●

NEW PREMISES will shortly be erected in New Westminster, B. C., to house wholesale and retail operations of McLennan, McFeely & Prior Ltd., well known hardware, electrical, sporting goods, china, and ships' chandlery establishment, which has headquarters in Vancouver.

●

LINNECKE ELECTRIC Co., 135 High St., Reno, Nevada, has been appointed subdistributor for Hotpoint Appliances in Nevada. The distributorship comes under that of the Electric Kitchen Appliances Co. of San Francisco. Harry Linnecke, electrical contractor-dealer, has been a prominent figure in Reno since 1907. Unique is his shop, located at his residence with a separate showroom at the rear. He will establish Hotpoint dealerships throughout Nevada.

●

EMERSON ELECTRIC Manufacturing Co. last month established 41 field service stations for the handling and repairs of motors. Those in the West include:

S. J. Perry, Butte; W. M. Smith Elec. Co., Dallas; Wazee Electric Wks., Denver; Slaughter Elec. & Mach. Co., El Paso; Houston Armature Wks., Houston; Industrial Electric Service, Los Angeles; Electric Rewinding Co., Phoenix; Wolff Electric Wks., Portland; Fellstrom Electric Co., Seattle; Utah Electric Motor Co., Salt Lake City; Graham & Collins Electric Co., San Antonio; Weidenthal-Gosliner Elec. Wks., San Francisco; Nixon-Kimmel Co., Spokane.

●

QUALITY ELECTRIC CO., LTD., 1235 E. Olympic Blvd., Los Angeles, has acquired rights to the Dickson Automatic Clutch.

●

WESTERN COLORADO POWER Co. has located a commercial office in Montrose, Colo., with DeLamar Holt in charge.

●

ASSOCIATED SALES ENGINEERS, 912 E. Third St., Los Angeles, has been appointed southern California and Arizona representative for the carbon brushes of Helwig Co., and products of Lovejoy Flexible Coupling Co.

SEGURSON ELECTRIC SHOP, 5132 Northeast Union Ave., has started a new electric store in Portland with Ray Segurson, former Hotpoint factory representative, in charge. Associated with him are L. D. Hewitt, A. F. Smythe and H. C. Spiegelberg.

●

Pacific Electric Mfg. Corp., has established New York representatives: Filbert & Fredericks, 90 West St.

●

SODEN ELECTRIC Co., Twin Falls, Idaho, remodeled and relighted in anticipation of improved spring business. John Soden is owner, manager.

●

GENERAL APPLIANCE Co., 2331 Southwest Sixth, is a new dealer in Portland. Roy Smith and Stanley Wright are proprietors of the new, smartly styled store.

●

THE GRAYBAR ELECTRIC Co. has opened a branch office at Harrison and East Front Street, Butte, Montana. E. J. Riley was appointed manager with C. M. Lawrence as service supervisor.

●

J. H. McRAE Co., Ltd., has incorporated in electrical contracting at Vancouver, established offices at 1641 W. 2nd Ave.

MAYDWELL

Glass Insulators

All Standard Numbers For All Purposes

Made of high quality materials in a modern Pacific Coast plant producing an unusually tough glass to withstand all severe service conditions.

MAYDWELL & HARTZELL INCORPORATED

Electrical Engineers and Manufacturers' Representatives

Los Angeles ★ San Francisco

GLEN PUTMAN, formerly with J. C. Penny Co., has opened an electrical appliance shop in Chelan, Wash., carrying the G. E. line.

●

OLD TIMERS of the Puget Sound Power & Light Co., who have been in the ranks 25 years or longer, will hold their annual meeting June 25. Some 20 new members will be initiated.

●

A NEW STORE handling major home appliances has been opened in Yakima, Wash., at 23 N. Front St., by J. J. Crawford and D. T. Musselman, under the name of Crawford & Musselman.

●

HOLMES ELECTRIC APPLIANCE CO., which opened late last year at Tenth and Grove Sts., Boise, Idaho, carries G.E. appliances and air conditioning, has its sales program underway.

●

REX. HARDWARE CO., Petaluma, Calif., is employing a merchandising coach to display heavy home appliances at customers' homes throughout the city and adjacent territory.

●

I. R. JOHNSTON has opened a new electrical store at First and Howard Sts., Spokane. Mr. Johnston operates a similar store, which includes installation and service departments, at Coeur d'Alene.

●

SALINAS ELECTRIC WORKS moved from a location it has held for a great number of years to a new store directly across the street on the main artery of Salinas, Calif. W. L. Evans and his son are proprietors.

●

ELECTRIC SUPPLY CO., 12th and Fallon Sts., Oakland, and the Sacramento Electric Supply Co., 711 M St., Sacramento, have been appointed distributors in California for the Automatic Washer Co.

BOOKS

INDUSTRIAL ELECTRICAL AND WIRING: James A. Moyer, S.B., A.M., and John F. Wostrel; Second Edition; 8 x 5½ inches, 502 pages; published by the McGraw-Hill Book Company, Inc.; available at the McGraw-Hill Book Room, 883 Mission St., San Francisco; $2.75. Written for those who aim at proficiency in wiring, this book covers all phases of approved wiring methods, is revised to the first of this year to conform with the latest wiring rules as set forth in the "National Electric Code" and the "National Electric Safety Code."

●

DIELECTRIC PHENOMENA IN HIGH VOLTAGE CABLES; D. M. Robinson, Ph. D., and P. V. Hunter, C.B.E.; 8 x 5½ inches, 173 pages; published by Instruments Publishing Company, Pittsburgh; $5. Intent of this volume is to orient the reader with respect to available knowledge in the field of dielectrics. Its subject is the performance of dielectric in the finished product and the way in which that performance may be effected by construction and subsequent history of cable. Bibliographies are included for those wishing to extend their knowledge in a particular direction.

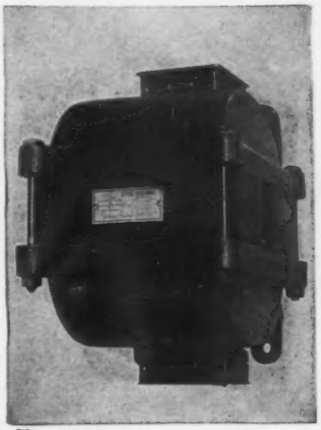
●

ELECTRON TUBES IN INDUSTRY; Keith Henney, editor, *Electronics;* Second Edition; 9 x 6 inches, 539 pages; published by McGraw-Hill Book Co., Inc.; available at the McGraw-Hill Book Room, 883 Mission St., San Francisco; $5. Intended for engineers, teachers and students, the second edition covers the many applications of amplifiers, oscillators, phototubes, rectifiers, thyratrons, grid-glow tubes, and cathode-ray tubes to noncommunication industries. All material has been reset, the latest literature in the field drawn upon, outmoded circuits replaced with those which are up to date.

●

HANDBOOK OF ENGINEERING FUNDAMENTALS, O. W. Eshbach, E.E., M.S., editor, and 40 contributors; 6x9 in.; 1,081 pages, illustrated; published by John Wiley & Sons, Inc.; price $5. Emphasizing fundamentals, "Eshbach" deals with mathematics, physics and chemistry. Extensive tables include those usually found in such works together with a series of conversion factors for weights and measures arranged in order of dimensional sequence, tables of integrals, standard structural shapes, and physical properties of materials. It does not include material on earthwork, surveying or astronomy. It does treat extensively of thermodynamics and electricity, and includes a chapter on contracts and the legal aspects of engineering.

YOU SAVE



With JEFFRIES

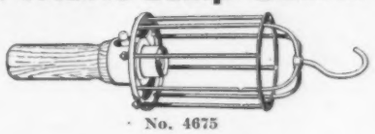
AIR COOLED TRANSFORMERS

● With a Jeffries Air Cooled Transformer money can be saved. The Air Cooled construction lengthens the life of the transformer and lowers repair costs. Plant expansion and extension can be made economically for a Jeffries Transformer provides the voltage change at the point desired without the need of long and expensive conduit runs. Besides a complete line of standard transformers, special designs and voltage furnished to order. Type S. S. Transformer 1 to 5 K.V.A. illustrated.

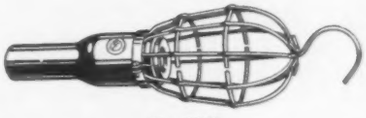
JEFFRIES TRANSFORMER COMPANY
5706 LONG BEACH AVE., LOS ANGELES

McGILL
Wood Handle
Portable Lamp Guards

Try as you may, you can't beat McGILL *Wood Handle* Portable Lamp Guards for low cost, long life service. Wood handles last a lifetime — are shock-proof — and are not affected by oil or certain acids. There's a size and style of McGILL Wood Handle Guard for every need. Can be furnished with lever switch control mounted in handle, and with or without reflectors.



No. 4675



No. 8000

ORDER FROM YOUR WHOLESALER

McGILL MANUFACTURING COMPANY
VALPARAISO, INDIANA

Box No. 604

CONNECTING INDUCTION MOTORS; A. M. Dudley, M.S.; Third Edition; 9 x 6 inches, 464 pages; published by the McGraw-Hill Book Co., Inc.; available at the McGraw-Hill Book Room, 883 Mission St., San Francisco; price $3.50. The long practical experience of the author should give the book an appeal to both student and engineer. Type has been completely reset and many illustrations remade, particularly the new and greatly enlarged series of standard diagrams, 2 to 14 poles. New material includes an interesting scheme for checking the direction of rotation of a motor without actually running it and a new chapter which gives in detail, step by step, with specific ratings, the method of calculating the performance of a motor from its dimensions and proposed winding.

●

CONNECTING AND TESTING DIRECT-CURRENT MACHINES; F. A. ANNETT, Associate Editor, *Power*, and A. C. Roe; Second Edition; 6 x 9 inches; 302 pages; published by McGraw-Hill Book Company, Inc., available at the McGraw-Hill Book Room, 883 Mission St., San Francisco; price $3. Chief revisions over the first edition, published 11 years ago, are the addition of 6 new chapters. One deals with the work done by the National Electric Manufacturing Assn. in classifying armature and field coils according to their insulation. Another deals with increasing machine ratings by changes in insulation and conductors and another with armature-coil leads. The other three chapters deal with new test methods.

Trade Literature

A postcard to the manufacturer or to ELECTRICAL WEST, 883 Mission St., San Francisco, will bring you any of these useful and informative publications.

DIRECT-ACTING GENERATOR-VOLTAGE REGULATOR for direct current machines, detailed description of the elements, diagrams of mountings and installation, operating sequences explained. General Electric Co.

●

LIGHTNING PROTECTIVE EQUIPMENT for a.c. rotating machines, describes problems encountered, recommends and describes various equipment for complete system protection. General Electric Co.

●

ELECTRIC CO_2 METERS, describes principles, illustrates equipment and applications for combustion indicating and recording equipment. The Brown Instrument Co.

●

HOW TO BUY AIR CONDITIONING gives a general description of the problems to be met, and the equipment available for overcoming them. Westinghouse Electric & Manufacturing Co.

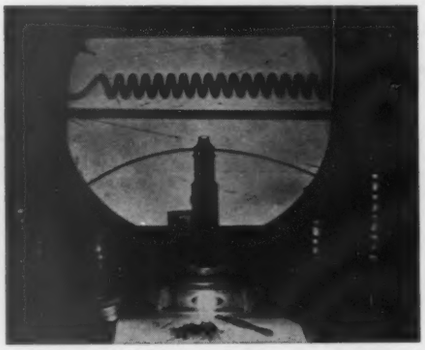
●

LIGHT FOR THE FARM, extensively illustrated, gives the many possible applications of lighting, lists bulbs and reflectors available. A table indexed according to light application illustrates and gives approximate price of units in upper, medium, and lower price ranges. A Field Tested Farm Lighting Program concerns lighting's part in forwarding rural electrification, includes the same table of equipment, concerns itself with promotion methods. Both published by the Incandescent Lamp Department of the General Electric Co.

New Products

Light Efficiency up 10%

A new method of forming tungsten filament said to improve heat characteristics so that light output is increased 10 per cent has been announced by the General Electric Incandescent Lamp Dept., and the Westinghouse Electric & Mfg. Co. It will be applied first to 60 watt, 100 to 130 volt lamps, then extended to others. It consists of double coiling a .0019-in. tungsten wire. It is first wound 335 turns to the inch around a thin molybdenum mandrel with .001-in. spacing between turns. This coil is coiled about another mandrel, 70 turns



In the illuminated zone, top to bottom, are an enlargement of the double coiled filament, a standard filament and a human hair

per inch with .007-in. spacing between secondary turns. A 20-in. length of tungsten wire is used and is ⅝ in. long when double coiled. Following the second coiling, mandrels are dissolved out by means of chemicals. The filament is mounted on the cross-bar between two lead-in wires, with one center support.

●

Large Hotpoint Roaster

A Hotpoint automatic electric roaster with removable pan large enough to accommodate a 16-lb. turkey, compactly designed for use in apartments, summer cottages, auto trailers, etc., has been announced by the Appliance and Merchandise departments of General Electric Co. Thermostat control for a.c. will regulate temperature between 150 and 550 deg. Laboratory tests show heating time from room temperature to 500 deg. to be 20 min. Maximum wattage is 1,320. One inch of sulphur-free rock wool insulation is provided on the four sides, 2 in. on the bottom. Dimensions are 21½x13¼x12½ in. Capacity is 16½ quarts, weight 23 lb., list price $24.95.

●

Range Wired for All Services

So that electric ranges may operate on 3-phase, 4-wire secondary distribution systems without changing elements or switches or rewiring, Walker & Pratt Mfg. Co. is offering Crawford ranges prewired for any distribution. They are equipped with double pole thermostats, and double pole timers are furnished when time control is desired.

●

Steel Crossarm Pin

A steel crossarm pin said to embody many new features has been introduced by Hubbard & Company. The body is formed of a rust-resisting alloy steel from which the thread is expanded. Designed for normal loading of 800 lb., it has a square base which fits an 11/16-in. cross arm hole. An installing rod is used to spread a wedge clip, locking the pin in the crossarm. Pins may be salvaged without impairment of the locking mechanism.

●

Photo Flood-Flash Lamp

A new light source for photographers to be known as the Flood-Flash lamp, has been announced by Westinghouse Electric & Manufacturing Co. Constructed as a bulb within a bulb, it measures 6 in. in length by 1½ in. in diam., consumes 100 watts, producing 3,000 lumens. However, by employing special equipment, high momentary discharges may be passed through it resulting in a flash at peak brilliancy of about 500,000 lumens with an average brilliancy of 300,000 lumens. The same lamp may be flashed as often as necessary. It is not yet commercially available.

●

Portable Range Folds Up

A portable electric range, 15¼x13-in. by 18⅝-in. high, which plugs into any convenience outlet, is being offered by the Go Electric Corporation. Two surface units pull downward out of the sides of the oven. Total width with sides both open is 28¼ inches. Maximum demand of the unit is 1,650 watts, the switches being constructed so that only one unit at a time may be operated at high heat. One surface unit draws 550 watts, the others and the oven 1,100 watts each.

●

Motors Cooled by Heat Exchange

A series of squirrel-cage motors protected against abrasive dust, moisture and corrosion and fan cooled by the heat exchanger principle has been announced by Westinghouse Electric & Mfg. Co. An internal fan circulates warm air through internal ducts, the walls of which are cooled by the external fans blowing large volumes of air through the external ducts, the two sets of ducts being separated by a common wall.

●

Double Coffee Brewer

Characterized as an essential to lavish entertaining is the Buffet Queen, a two burner Cory Coffee Brewer manufactured by the Glass Coffee Brewer Corp., Chicago. One 10-cup complete coffee brewer and an extra serving decanter are included. Each of the two heating elements is two-heats so that coffee can be kept either on brewing or serving temperature.

WHERE TO BUY IT IN THE WEST

TRY THE SUPER-POWERED JUMBO FIRST

IDEAL "JUMBO" cleaner Blows, Vacuums, Sprays. Powerful! Let us prove its superiority. 10 day free trial.

IDEAL COMMUTATOR DRESSER CO.
1042 Park Ave. Sycamore, Illinois

Air Conditioning
Frigidaire Corp.
General Elec. Co.
Graybar Elec. Co., Inc.
Kelvinator Corp.
Norge Division, Borg-Warner Corp.

Ammeters and Voltmeters
Ferranti Elec., Inc.
General Elec. Co.
Roller-Smith Co.
Westinghouse Elec. & Mfg. Co.
Weston Elec. Instr. Corp.

Anchors, Guy
A. B. Chance Co.
Everstick Anchor Co.
Hubbard & Co.
James R. Kearney Corp.
W. N. Matthews Corp.

Anchor and Guy Rods
A. B. Chance Co.
General Elec. Co.
Hubbard & Co.
Maydwell & Hartzell, Inc.

Appliances, Household
Chicago Flexible Shaft Co.
Easy Washing Machine Corp.
Edison Gen. Elec. Appliance Co., Inc.
Frigidaire Division
General Elec. Co.
General Elec. Supply Corp.
Graybar Elec. Co., Inc.
Kelvinator Division
Leonard Division
Lindemann & Hoverson Co., A. J.
Malleable Iron Range Co.
National Enameling & Stamping Co.
Norge Division
Standard Elec. Stove Co.
The Silex Co.
Thermador Elec'l Mfg. Co.
Wesix Elec. Heater Co.
Westinghouse Elec. Supply Co.
The Woolwine-Norris Corp.

Belts, Safety Straps, Pole Climbers
Western Hardware & Tool Co.

Boxes
General Cable Corp.
General Elec. Co.
Superior Switchboard & Devices Co.

Brackets, Wood
Locust Pin Co.

Breakers
Air Circuit Breakers
Electric Material Co.
General Elec. Co.
I-T-E Circuit Breaker Co.
Roller-Smith Co.
Sangamo Elec. Co.
Westinghouse Elec. & Mfg. Co.
Oil Circuit Breakers
Allis-Chalmers Mfg. Co.
Delta-Star Electric Co.
Electric Material Co.
General Elec. Co.
Pacific Elec. Mfg. Corp.
Roller-Smith Co.
Westinghouse Elec. & Mfg. Co.

Bus Fittings
Burndy Eng'g Co.
General Elec. Co.
Line Material Co.
Pacific Elec. Mfg. Corp.

Buses
Aluminum Co. of America

Cable Accessories
General Cable Corp.
General Elec. Co.
John A. Roebling's Sons Co.

Cables
Aluminum Co. of America
American Steel & Wire Co.
Columbia Steel Co.
Crescent Ins. Wire & Cable Co.
Crucible Steel Co. of America
General Cable Corp.
General Elec. Co.
Graybar Elec. Co., Inc.
Indiana Steel & Wire Co.
Maydwell & Hartzell, Inc.
National Elec. Products Corp.
The Okonite Co.
Okonite-Callender Cable Co.
Providence Insulated Wire Co.
Rockbestos Products Corp.
John A. Roebling's Sons Co.
United States Steel Corp.
Westinghouse Elec. & Mfg. Co.

Carbon Brushes
National Carbon Co., Inc.

Carbon Products
National Carbon Co., Inc.

Chimes
Square D Co.

Clamps, Ground
B. Hartman
Reliable Elec. Co.

Clocks, Program
Tork Clock Co., Inc.

Coffee Makers
The Silex Co.

Coil Winding
Jeffries Transformer Co.

Commutator Dressers
Ideal Commutator Dresser Co.

Compounds, Insulating
Clifton Mfg. Co.
John C. Dolph Co.
General Cable Corp.
General Elec. Co.
Irvington Varnish & Insulator Co.

Condensers, Electric
Allis-Chalmers Mfg. Co.
General Elec. Co.
Westinghouse Elec. & Mfg. Co.

Conduit
Aluminum Co. of America
General Elec. Co.
Youngstown Sheet & Tube Co.

Conduit, Flexible Metallic
General Elec. Co.
Wiremold Co.

Conduit, Underground
Fire Proof Wall Co.
Johns-Manville Corp.

Connectors
Burndy Eng'g Co.
Electric Power Equip. Corp.
G & W Elec. Specialty Co.
James R. Kearney Corp.
W. N. Matthews Corp.
Reliable Elec. Co.
L. W. Thompson

Controllers
Allis-Chalmers Mfg. Co.
Betts & Betts Corp.
General Elec. Co.
Square D Co.
Westinghouse Elec. & Mfg. Co.

Cutouts
G & W Elec. Specialty Co.
General Elec. Co.
James R. Kearney Corp.
Line Material Co.
W. N. Matthews Corp.
Schweitzer & Conrad, Inc.
Westinghouse Elec. & Mfg. Co.

Demand Control
General Elec. Co.
Wesix, Inc.

Distribution Specialties
G & W Elec. Specialty Co.
General Elec. Co.
Hubbard & Co.
James R. Kearney Corp.
Maydwell & Hartzell, Inc.
St. Louis Malleable Casting Co.
Superior Switchboard & Devices Co.

Electrodes, Arc Welding
General Elec. Co.
John A. Roebling's Sons Co.

Enclosures, Meter and Instrument
Superior Switchboard & Devices Co.

Fans
General Elec. Co.
Kisco Co., Inc.
Smallcomb Elec. Co.

Farm Electrification Equipment
General Elec. Co.

Fittings, Conduit
General Elec. Co.
B. Hartman

Fittings, Insulator
Brewer-Titchener Corp.

Fixtures, Lighting
Benjamin Elec. Mfg. Co.
Curtis Lighting, Inc.
General Elec. Co.
Pittsburgh Reflector Co.
Smoot-Holman Co.
Westinghouse Elec. & Mfg. Co.

Floodlighting
Crouse-Hinds Co.
Curtis Lighting, Inc.
General Elec. Co.
Pittsburgh Reflector Co.
S & M Lamp Co., Inc.
Smoot-Holman Co.
Westinghouse Elec. & Mfg. Co.

Flumes
California Corrugated Culvert Co.
R. Hardesty Mfg. Co.
Pure Iron Culvert & Mfg. Co.
Washington Corrugated Culvert Co.
Western Metal Mfg. Co.

Gates
California Corrugated Culvert Co.
R. Hardesty Mfg. Co.
Pure Iron Culvert & Mfg. Co.
Washington Corrugated Culvert Co.
Western Metal Mfg. Co.

Generators
Allis-Chalmers Mfg. Co.
General Elec Co.
Westinghouse Elec. & Mfg. Co.

Graphite Products
National Carbon Co., Inc.

Ground Rods
Maydwell & Hartzell, Inc.

Heaters, Air
Edison Gen. Elec. Appliance Co.
Noblitt-Sparks Industries, Inc.
Thermador Elec'l Mfg. Co.
Wesix Elec. Heater Co.
Edw. L. Wiegand Co.

Heaters, Water
Edison Gen. Elec. Appliance Co.
Electro Hot Heater Co.
Fowler Mfg. Co.
Lindemann & Hoverson Co., A. J.
Malleable Iron Range Co.
Standard Elec. Stove Co.
Thermador Elec'l Mfg. Co.
Wesix Elec. Heater Co.
Westinghouse Elec. & Mfg. Co.

Heating Element—Repair Part
Edw. L. Wiegand Co.

Instruments, Measuring and Recording
See Ammeters, Voltmeters, Wattmeters.

Insulation
General Elec. Co.
Irvington Varnish & Insulator Co.
Johns-Manville Corp.
Ohio Brass Co.

Insulators
Brewer-Titchener Corp.
Corning Glass Works
Graybar Elec. Co., Inc.
Hemingray Glass Co.
Geo. E. Honn Co.
Lapp Insulator Co., Inc.
Maydwell & Hartzell, Inc.
Ohio Brass Co.
Owens-Illinois Glass Co.
Westinghouse Elec. & Mfg. Co.

Ironers
Easy Washing Machine Corp.
General Elec. Co.
Norge Division, Borg-Warner Corp.
Savage Distributing Co.

Knobs, Tubes, Cleats
Standard Elec'l Porcelain Mfrs.

Lamp Guards
McGill Mfg. Co.

Lamp Replacers
G. C. A. Mfg. Co.

Lamps, I. E. S.
Faries Mfg. Co.
General Elec. Co.

Lamps, Mazda
General Elec. Co.
Westinghouse Lamp Co.

Lamps, Sun
General Elec Co.

Lighting Equipment
Benjamin Elec. Mfg. Co.
Crouse-Hinds Co.
Curtis Lighting, Inc.
Faries Mfg. Co.
Kim Mfg. Co.
Smoot-Holman Co.
Westinghouse Elec. & Mfg. Co.
Wuelker Lighting Co.

Line Material
Maydwell & Hartzell, Inc.
Ohio Brass Co.

Meters
General Elec. Co.
Lincoln Meter Co.
L. A. Nott
Sangamo Elec. Co.
Westinghouse Elec. & Mfg. Co.
Weston Elec'l Instrument Corp.

Motors
Allis-Chalmers Mfg. Co.
General Elec. Co.
Westinghouse Elec. & Mfg. Co.

Motor Starters
Allis-Chalmers Mfg. Co.
General Elec. Co.
Square D Co., Inc.
Westinghouse Elec. & Mfg. Co.

Oil, Lubricating
Shell Oil Co.
The Texas Co.

Oil, Transformer & Switch
General Elec. Co.
Shell Oil Co.
The Texas Co.

Panel Boards
General Elec. Co.
Square D Co.
Superior Switchboard & Devices Co.
Westinghouse Elec. & Mfg. Co.

Photoelectric Cells
General Elec. Co.
Weston Elec'l Instrument Corp.

Pins, Wood
Locust Pin Co.

Pole Line Hardware
Brewer-Titchener Corp.
General Electric Supply Corp.
Graybar Electric Co., Inc.
Hubbard & Company
Joslyn Co. of California
Kortick Mfg. Co.
Maydwell & Hartzell, Inc.

Porcelain
Standard Elec. Porcelain Mfrs.

Public Utilities
California Oregon Power Co.
Idaho Power Co.
Mountain States Power Co.
Northwestern Electric Co.
Pacific Gas and Electric Co.
Pacific Power & Light Co.
Portland General Electric Co.
Puget Sound Power & Light Co.
San Diego Cons. Gas & Elec. Co.
San Joaquin Light & Power Corp.
Southern California Edison Co. Ltd.
Utah Power & Light Co.
Washington Water Power Co.

Pullers, Slack
A. B. Chance Co.

Pumps
Pelton Water Wheel Co.

Range Units
Edison Gen. Elec. Appliance Co.
Edwin L. Wiegand Co.

Ranges
Edison Gen. Elec. Appliance Co.
General Elec. Co.
General Elec. Supply Corp.
Kelvinator Corp.
Lindemann & Hoverson Co., A. J.
Malleable Iron Range Co.
Norge Division, Borg-Warner Corp.
Standard Elec. Stove Co.
Westinghouse Elec. & Mfg. Co.

Reflectors
Benjamin Elec. & Mfg. Co.
Curtis Lighting, Inc.
Pittsburgh Reflector Co.
Reflector & Illuminating Co.
Smoot-Holman Co.
Westinghouse Elec. & Mfg. Co.
Wuelker Lighting Co.

Refrigerators
Frigidaire Corp.
General Elec. Co.
General Elec. Supply Corp.
Graybar Elec. Co., Inc.
Kelvinator Corp.
Leonard Refrigerator Co.
Malleable Iron Range Co.
Norge Division, Borg-Warner Corp.
Westinghouse Elec. & Mfg. Co.

Relays
General Elec. Co.
Roller-Smith Co.
Square D Co.
Ward Leonard Elec. Co.

PRINT IN BINDING

Where to Buy It in the West—*Continued*

G.C.A.

Lamp Replacers
Lamp Base Removers
Cartridge Fuse Tongs
Switch Hooks

Send for Catalogue

We have been making safety tools for 20 years

The G. C. A. Manufacturing Co.
Pittsfield, Mass.

Rheostats & Resistors
General Elec. Co.
Ward Leonard Elec. Co.
Westinghouse Elec. & Mfg. Co.

Rosters
National Enameling & Stamping Co.
Westinghouse Elec. & Mfg. Co.

Rolls, Wringer
Lovell Mfg. Co.

Rural Line Hardware
General Elec. Supply Corp.
Graybar Elec. Co., Inc.
Hubbard & Co.
Joslyn Co. of Calif.
Kortick Mfg. Co.
Maydwell & Hartzell, Inc.

Service Organizations
Crocker First National Bank
Elec'l Testing Labs.
McGraw-Hill Book Co.
Northwest Elec. Light & Power Association
Pacific Coast Elec'l Bureau
Pacific Coast Elec'l Ass'n

Strand, Guy
Maydwell & Hartzell, Inc.
Pacific Wire Rope Co.

Street Lighting Fixtures
General Elec. Co.
Graybar Elec. Co., Inc.
Hubbard & Co.
Line Material Co.
Westinghouse Elec. & Mfg. Co.

Switchboards
Allis-Chalmers Mfg. Co.
General Elec. Co.
Roller-Smith Co.
Square D Co.

Switches, Disconnect
Delta-Star Electric Co.
Electric Power Equip. Corp.
General Elec. Co.
Kearney Corp., James R.
Line Material Co.
Pacific Elec. Mfg. Corp.
Schweitzer & Conrad, Inc.
Westinghouse Elec. & Mfg. Co.

Switches, Fuse
General Elec. Co.
Kearney Corp., James R.
Schweitzer & Conrad, Inc.

Switches, Heater
General Elec. Co.

Switches, High Tension
Bowie Switch Co.
James R. Kearney Corp.

Switches, Meter Test
General Elec. Co.
Meter Devices Co.
Square D Co.
Superior Switchboard & Devices Co.

Switches—Pressure and Temperature
Square D Co., Inc.

Switches, Safety
Colt's Patent Fire Arms Mfg. Co.
General Elec. Co.
McGill Mfg. Co.
Square D Co., Inc.
Westinghouse Elec. & Mfg. Co.

Switches, Thermostat Controlled
Colt's Patent Fire Arms Mfg. Co.
General Elec. Co.
Thermador Elec'l Mfg. Co.

Switches, Time
General Elec. Co.
Maydwell & Hartzell, Inc.
Sangamo Elec. Co.

Switchgear
Allis-Chalmers Mfg. Co.
Delta-Star Electric Co.
General Electric Co.
I-T-E Circuit Breaker Co.
Westinghouse Elec. & Mfg. Co.

Tapes—Friction and Rubber
Clifton Mfg. Co.
Geo. E. Honn Co.

Telephone & Telegraph Hardware & Specialties
General Elec. Supply Corp.
Graybar Elec. Co., Inc.
Hubbard & Co.
Maydwell & Hartzell, Inc.

Telephone Systems—Private
American Automatic Elec. Sales Co.

Terminals, Cable
General Cable Corp.
General Elec. Co.

Testing Devices
Superior Switchboard & Devices Co.

Tools
Mathias Klein & Sons
Maydwell & Hartzell, Inc.

Tools, Live Line
A. B. Chance Co.
James R. Kearney Corp.
Sangamo Elec. Co.
Western Hardware & Tool Co.

Tools, Tree Trimming
Bartlett Mfg. Co.

Transformers
Allis-Chalmers Mfg. Co.
American Transformer Co.
Gardner Elec. Mfg. Co.
General Elec. Co.
Jeffries Transformer Co.
Line Material Co.
Western Transformer Co.
Westinghouse Elec. & Mfg. Co.

Tubing, Elec'l Metallic
Aluminum Co. of America
Youngstown Sheet & Tube Co.

Turbines
Pelton Water Wheel Co.

Valves
Ohio Brass Co.
Pelton Water Wheel Co.

Washers, Clothes
Easy Washing Machine Corp.
General Elec. Co.
Little Giant, Inc., Ltd.
Norge Division, Borg-Warner Corp.

Wattmeters
General Elec. Co.
L. A. Nott
Roller-Smith Co.
Sangamo Elec. Co.
Westinghouse Elec. & Mfg. Co.
Weston Elec. Instrument Corp.

Water Wheels
Pelton Water Wheel Co.

Wire
Aluminum Co. of America
American Steel & Wire Co.
Columbia Steel Co.
Crescent Ins. Wire & Cable Co.
Crucible Steel Co.
General Cable Corp.
General Electric Co.
Hazard Ins. Wire Works
Indiana Steel & Wire Co.
C. E. Ingalls
Keystone Steel & Wire Co.
Maydwell & Hartzell, Inc.
The Okonite Company
Pacific Wire Rope Co.
Providence Ins. Wire Co.
Rockbestos Products Corp.
John A. Roebling's Sons Co.
United States Steel Corp.
Westinghouse Elec. & Mfg. Co.
Wiremold Co.

Wiring Supplies
Airey Co., F. J.
Crouse-Hinds Co.
General Elec. Supply Corp.
Graybar Elec. Co., Inc.
Irvington Varnish & Insulator Co.
McGill Mfg. Co.
Westinghouse Elec. Supply Co.
Wiremold Co.

Wringer Rolls
Lovell Mfg. Co.

INDEX TO ADVERTISERS

June, 1937

Allis-Chalmers Mfg. Co. 25
Aluminum Company of America 2
American Automatic Elec. Sales Co. 162

Bartlett Mfg. Co. 175
Benjamin Elec. Mfg. Co. 41
Borg-Warner Corp. 33
Brewer-Titchener Corp. 5

California-Oregon Power Co. 82, 83
Chance Company, A. B. 183
Chicago Flexible Shaft Co. 182
Classified Section 182
Columbia Steel Co. 21
Corning Glass Works 29
Crescent Ins. Wire & Cable Co. 24
Crocker First National Bank 175

Easy Washing Machine Corp. 35
Edison General Elec. Appliance Co., Inc. 36, 37
Electric Power Equipment Corp. 168
Electrical Testing Laboratories 176
Everstick Anchor Co. 184

Frigidaire Corp. 39

Gardner Elec. Mfg. Co. 179
G. C. A. Mfg. Co. 188
General Cable Corp. 42
General Electric Co. 7, 28, 38, 44, 170

Hartman, B. 181
Hazard Ins. Wire Works 8
Honn Co., Geo. E. 184
Hubbard and Company ..... Inside Back Cover

Idaho Power Co. 82, 83
Ideal Commutator Dresser Co. 187
Indiana Steel & Wire Co. 183
Irvington Varnish & Insulator Co. 161
I-T-E Circuit Breaker Co. 165

Jeffries Transformer Co. 185
Johns-Manville Corp. 30, 31
Joslyn Company of California 172

Kearney Corp., James R. 171
Kisco Co., Inc. 180
Klein & Sons, Mathias 164

Lapp Insulator Co., Inc. 43
Lincoln Meter Co. 180
Line Material Co. 27, 178
Locust Pin Co. 182

Maydwell & Hartzell, Inc. 43, 171, 179, 182, 184
McGill Mfg. Co. 185
Mountain States Power Co. 82, 83

Norge Division, Borg-Warner Corp. 33
Northwest Electric Light & Power Assn. 20
Northwestern Electric Co. 82, 83

Okonite Company, The 8
Okonite-Callender Cable Co., Inc. 8
Owens-Illinois Glass Co. 8

Pacific Coast Electrical Ass'n. 18
Pacific Coast Electrical Bureau ..... Back Cover
Pacific Electric Mfg. Corp. 22
Pacific Gas and Electric Co. 16, 17
Pacific Power & Light Co. 82, 83
Pelton Water Wheel Co. 169
Pittsburgh Reflector Co. 4
Portland General Electric Co. 82, 83
Professional Directory 182
Providence Ins. Wire Co. 178
Puget Sound Power & Light Co. 82, 83

Reliable Electric Co. 174
Roebling's Sons Co., John A. 23

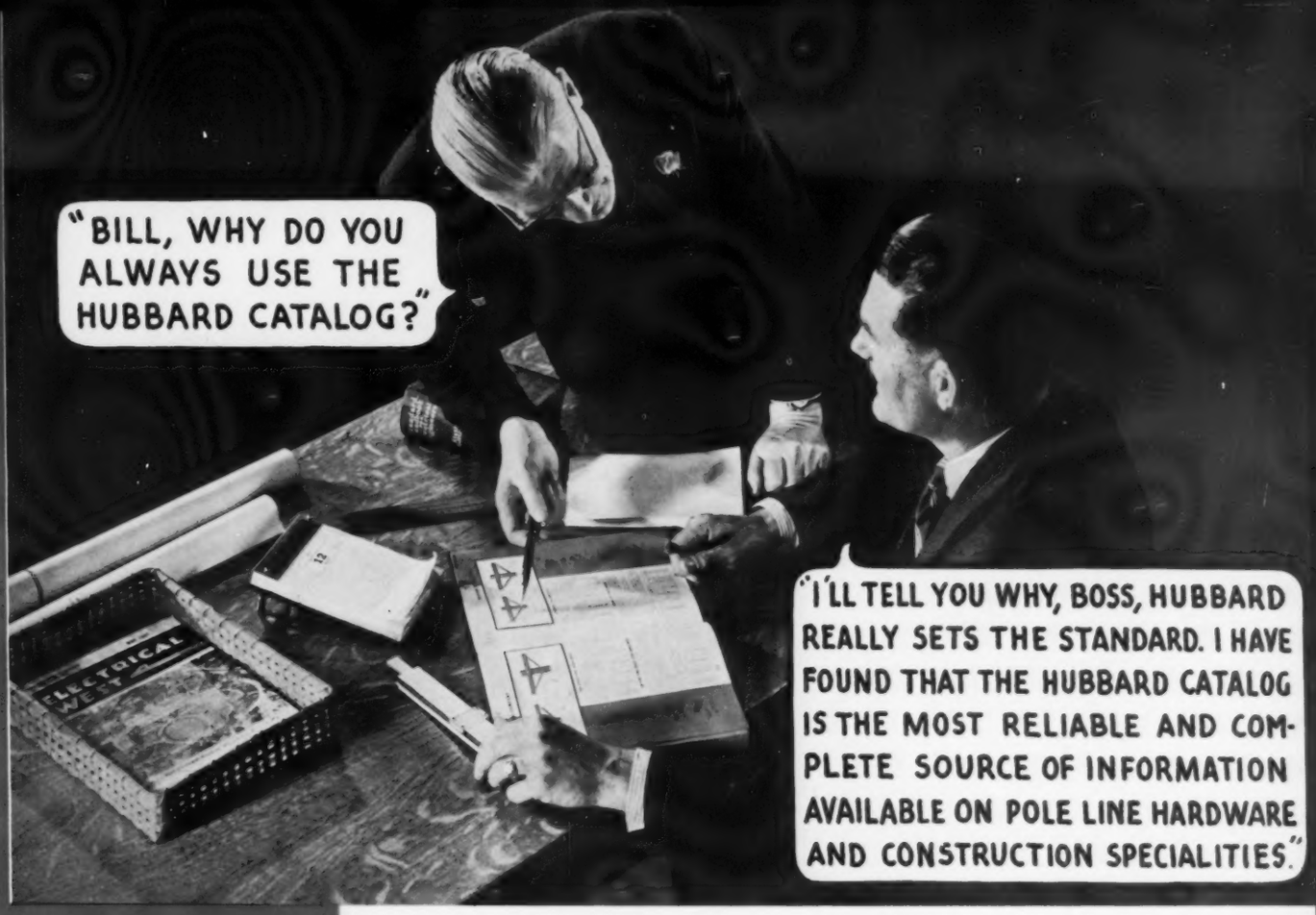
San Diego Cons. Gas & Elec. Co. 15
Sangamo Electric Co. 166
San Joaquin Light & Power Corp. 19
Schweitzer & Conrad, Inc. 175
Shell Oil Company 163
Smallcomb Electric Co. 180
Smoot-Holman Co. 32
Southern California Edison Co. Ltd. ..... Inside Front Cover
Square D Company 167

Texas Company, The 26
Thermador Electrical Mfg. Co. 40

Utah Power & Light Co. 82, 83
United States Steel Corp. 21

Ward Leonard Elec. Co. 184
Washington Water Power Co. 82, 83
Wesix Electric Heater Co. 181
Westinghouse Electric & Mfg. Co. 9, 10, 11, 12, 13, 14 177
Weston Elec. Instrument Corp. 6
Wiegand Co., Edwin L. 182
Woolwine-Norris Corp., The 34
Wuelker Lighting Co. 182

Youngstown Sheet & Tube Co. 173


"BILL, WHY DO YOU ALWAYS USE THE HUBBARD CATALOG?"
"I'LL TELL YOU WHY, BOSS, HUBBARD REALLY SETS THE STANDARD. I HAVE FOUND THAT THE HUBBARD CATALOG IS THE MOST RELIABLE AND COMPLETE SOURCE OF INFORMATION AVAILABLE ON POLE LINE HARDWARE AND CONSTRUCTION SPECIALITIES."

When ENGINEERS NEED HARDWARE for any type of line construction they consult the HUBBARD CATALOGUE

ENGINEERS always specify Hubbard hardware because they know they will receive hardware and construction specialties that are well engineered and of a standard of quality that assures them of the utmost in economical construction and low maintenance cost.

Prompt service is provided on all Hubbard items by a Pacific Coast factory plus adequate stocks carried by 25 branches of the General Electric Supply Corporation and the Graybar Electric Company.

To solve your special problems consult with the staff engineers at Hubbard's Pacific Coast Factory.

IF YOU HAVEN'T A COPY OF HUBBARD'S CATALOG NO. 38 WRITE FOR IT TODAY.

Hubbard and COMPANY

OAKLAND, CAL. PITTSBURGH CHICAGO

YESTERDAY TODAY TOMORROW

THE lines we laid yesterday determined today's limitations. Just as surely, a larger and more progressive attitude TODAY is laying the foundation for a greater TOMORROW.

Every man in the electrical industry owes his job to the little copper wires that deliver electricity. This is true whether he is a utility president, a contractor, salesman, manufacturer, clerk, or distributor of electrical equipment.

That's why we urge the industry—every branch of it—to sell wiring. Wiring is the foundation of the industry's future. It alone will determine whether or not the industry reaps its golden harvest.

We must not sell wiring barely sufficient for today's need, but must provide for next year and many years after that. We must sell wiring that will clear the tracks for the sale of equipment now on the market and that to be developed in the next few years.

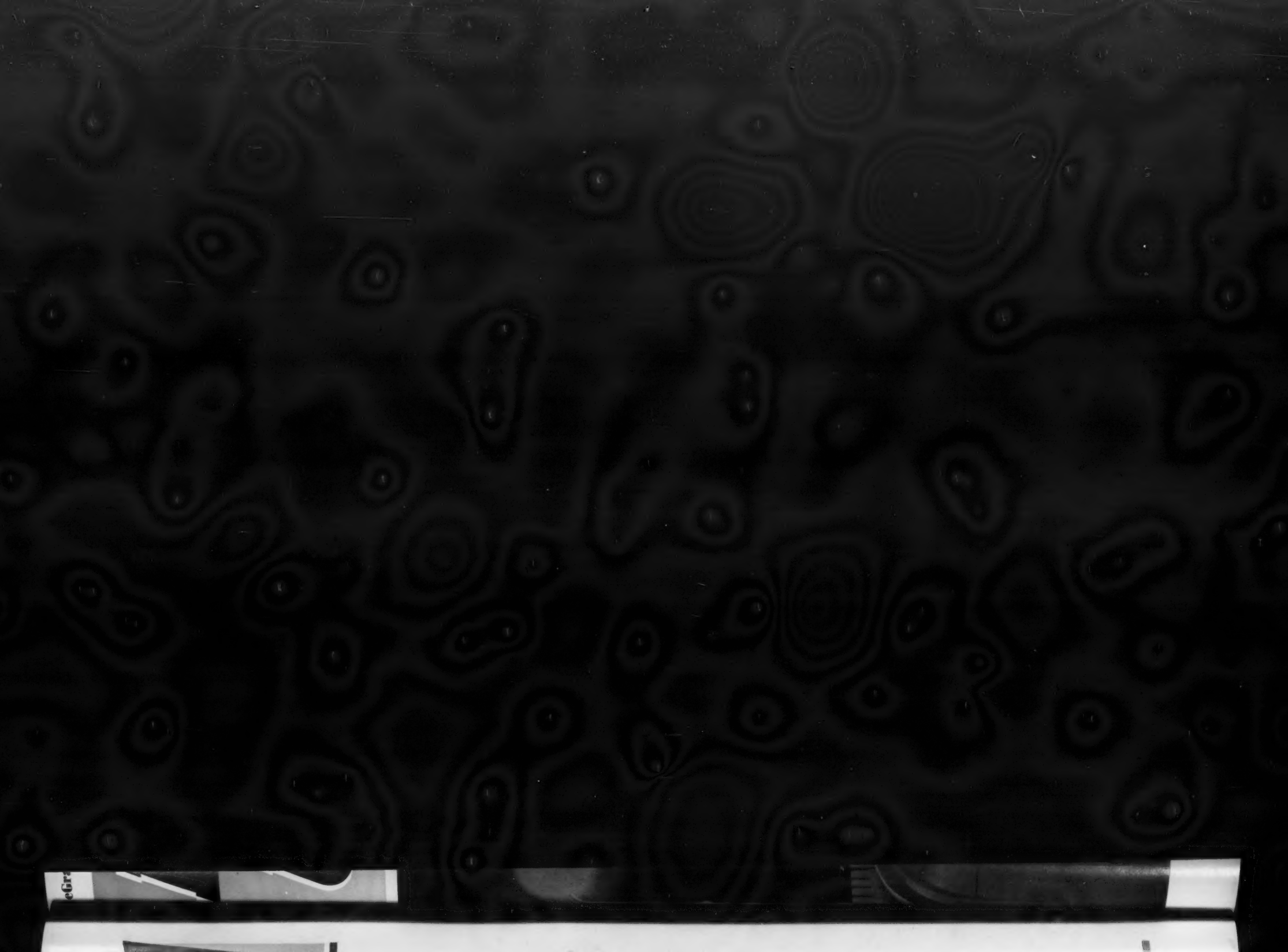
We must talk wiring that will accommodate air conditioning equipment so that sales will not be blocked because of inadequate wiring.

It takes a whole crew of star salesmen to sell electric cooking and water heating where the customer must first make a large outlay for wiring. But obvious advantages of electric cookery sell ranges easily where the wiring is already installed.

The limitations of this industry's future are being determined in the wiring installed in buildings now being erected.

Right now is the time to sell "plus" wiring, while the building boom is in full swing.

Let's all talk wiring.

★ *Pacific Coast Electrical Bureau* ★ ★ ★ ★

601 West Fifth Street, Los Angeles, California
447 Sutter Street, San Francisco, California